

An aerial photograph of a large port area. Numerous colorful shipping containers (red, blue, orange, green, pink) are stacked in neat rows. Several large blue and yellow gantry cranes are positioned over the containers, and smaller yellow forklifts are visible on the ground. The scene is captured from a high angle, showing the organized layout of the port.

ENHANCING COLLABORATION IN LOGISTICS KNOWLEDGE TRIANGLE: A EUROPEAN ANALYSIS

Edited by Sara Scipioni, Federico Niccolini, Marco Giannini

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I. Scipioni Sara II. Niccolini, Federico III. Giannini Marco 1. Logistica aziendale 2. Aziende - Organizzazione

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Coordinator



UNIVERSITÀ DI PISA

Partners



Authors and Contributors

Bisogni Paolo, Associazione italiana di logistica e di supply chain management (Italy)

Carvalho Dorothea, European Logistics Association (Belgium)

Cotovanu Ana Maria, Finance & Banking, Associazione per lo Sviluppo Organizzativo e delle Risorse Umane (Italy)

D'Acunto Federica, Finance & Banking, Associazione per lo Sviluppo Organizzativo e delle Risorse Umane (Italy)

Foris Tiberiu, Universitatea Transilvania Din Brasov (Romania)

Gaiotto Beatrice, Università di Pisa (Italy)

Geerkens Nicole, European Logistics Association (Belgium)

Giannini Marco, Università di Pisa (Italy)

Kabakchieva Dorina, University Of National And World Economy (Bulgaria)

Marinescu Nicolae, Universitatea Transilvania Din Brasov (Romania)

Niccolini Federico, Università di Pisa (Italy)

Nicolau Cristina, Universitatea Transilvania Din Brasov (Romania)

Pisarciuc Cristian, Universitatea Transilvania Din Brasov (Romania)

Poțincu Cristian, Universitatea Transilvania Din Brasov (Romania)

Poțincu Laura, Universitatea Transilvania Din Brasov (Romania)

Rakovska Miroslava, Bulgarian Logistics Association (Bulgaria)

Scipioni Sara, Università di Pisa (Italy)

Spatafora Mario, Finance & Banking, Associazione per lo Sviluppo Organizzativo e delle Risorse Umane (Italy)

Stefanova Kamelia, University of National and World Economy (Bulgaria)

Stratieva Styliana, Bulgarian Logistics Association (Bulgaria)

Detailed list of main authors and contributors

<i>Chapter/ Reference</i>	<i>Main authors</i>	<i>Contributors</i>
INTRODUCTION	Marco Giannini, UNIP Federico Niccolini, UNIP Sara Scipioni, UNIP	
Chapter 1 COMPENDIUM OF GOOD PRACTICES OF COLLABORATION AMONG HIGHER EDUCATION, RESEARCH AND BUSINESS IN THE LOGISTIC AREA	Kamelia Stefanova, UNWE Dorina Kabakchieva, UNWE	Miroslava Rakovska, BLA Stilyana Stratieva, BLA Marco Giannini, UNIP Sara Scipioni, UNIP Mario Spatafora, Effebi Ana Maria Cotovanu, Effebi Paolo Bisogni, AIOLOG Cristian Poțincu, UTBv Laura Poțincu, UTBv Nicole Geerkens, ELA
Chapter 2 DEFINING A KNOWLEDGE TRIANGLE FRAMEWORK FOR THE LOGISTIC AREA	Sara Scipioni, UNIP Marco Giannini, UNIP	Mario Spatafora, Effebi Kamelia Stefanova, UNWE Dorina Kabakchieva, UNWE Paolo Bisogni, AIOLOG Cristian Poțincu, UTBv Laura Poțincu, UTBv
Chapter 3 METHODS AND INSTRUMENTS FOR ENHANCING THE KNOWLEDGE TRIANGLE	Sara Scipioni, UNIP Marco Giannini, UNIP	Mario Spatafora, Effebi Kamelia Stefanova, UNWE Dorina Kabakchieva, UNWE Paolo Bisogni, AIOLOG Cristian Poțincu, UTBv Laura Poțincu, UTBv
Chapter 4 BUILDING THE STAKEHOLDERS' ENGAGEMENT PLAN	Sara Scipioni, UNIP Beatrice Gaiotto, UNIP Federico Niccolini, UNIP Marco Giannini, UNIP	Kamelia Stefanova, UNWE Dorina Kabakchieva, UNWE Cristina Nicolau, UTBv
Chapter 5 GUIDELINES FOR IMPLEMENTING AN EFFECTIVE KNOWLEDGE TRIANGLE	Sara Scipioni, UNIP Beatrice Gaiotto, UNIP Federico Niccolini, UNIP Marco Giannini, UNIP	Kamelia Stefanova, UNWE Dorina Kabakchieva, UNWE Nicole Geerkens, ELA Cristina Nicolau, UTBv Paolo Bisogni, AIOLOG

Chapter 6 MAPPING THE QUALITY ASSURANCE AND ASSESSMENT CHALLENGES	Mario Spatafora, Effebi Ana Maria Cotovanu, Effebi Federica D'Acunto, Effebi	Sara Scipioni, UNIPi Marco Giannini, UNIPi Federico Niccolini, UNIPi
Chapter 7 HIGH EDUCATION INSTITUTIONS GUIDELINES FOR ENHANCING QUALITY ASSURANCE AND ASSESSMENT STRATEGIES	Mario Spatafora, Effebi Ana Maria Cotovanu, Effebi Federica D'Acunto, Effebi	Sara Scipioni, UNIPi Marco Giannini, UNIPi Federico Niccolini, UNIPi
Chapter 8 VALIDATION REPORT REGARDING FRAMELOG AND THE MANUAL FOR ASSESSMENT AND QUALITY ASSURANCE and Appendix 1	Cristina Nicolau, UTBv	Cristian Pisarciuc, UTBv Nicolae Marinescu, UTBv Tiberiu Foris, UTBv Sara Scipioni, UNIPi Federico Niccolini, UNIPi Marco Giannini, UNIPi Miroslava Rakovska, BLA Stilyana Stratieva, BLA Kamelia Stefanova, UNWE Dorina Kabakchieva, UNWE
Appendix 2: National report for Bulgaria	Miroslava Rakovska, BLA Stilyana Stratieva, BLA	
Appendix 3: National report for Italy	Sara Scipioni, UNIPi Federico Niccolini, UNIPi Marco Giannini, UNIPi	
Appendix 4: National Report for Romania	Cristina Nicolau, UTBv	Cristian Pisarciuc, UTBv Nicolae Marinescu, UTBv Tiberiu Foris, UTBv
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INTRODUCTION

The FRAMELOG project (acronym for “European framework for Knowledge Triangle in the Logistic sector”) was created with the scope to study and encourage the cooperation among three organizational macro-categories composing the Knowledge Triangle: private companies, research centres, and high education institutions (Markkula, 2013; Unger & Polt, 2017). The application field was the sector that is constantly becoming more and more strategic for companies and national economies: Logistics¹. The project was coordinated by the Economics and Management Department of the University of Pisa, with a 36-month duration from September 2016 until August 2019.

Different countries and typologies of organizations have participated to the project. In addition to the three academic Partners, University of Pisa (Italy), University of National and World Economy (Bulgaria); Bulgarian Logistics Association (Bulgaria); University of Transylvania (Romania), the other Participating Partners were the followings: Finance & Banking Association for Organizational Development and Human Resources (EFFEBI, Italy); Italian Association of Logistics and Supply Chain Management (AILOG, Italy); European Logistics Association (ELA, Belgium).

From more than a decade, Logistics has been interested by a radical technological revolution (Christopher & Holweg, 2011). Digital technologies have been changing the way to perform Logistics (Büyükoğkan and Fethullah, 2018; Sanders and Swink, 2019). Some of these digital technologies, such as big data (Wang, 2016), and blockchain (Gurtu and Jestin, 2016) are modifying the working paradigms of the supply chain from an operational, managerial, strategic and even cultural point of view. The technolo-

1. The project was financed by the European Union under the Erasmus+ KA2 grant for “Cooperation for Innovation and the Exchange of Good Practices” (2016-1-IT02-KA203-024565).

gical, managerial, cultural and strategic changes that are affecting (and will be affecting) Logistics, imply necessary radical modifications in professional figures. In this context, the sector requires now to review and update its know-how to remain competitive in this changing environment.

The 2014-2016 Logistic Performance Indexes (The World Bank, 2014-2016) demonstrates that Europe is still the benchmark continent regarding the logistic systemic national effectiveness. Despite their leading position, consolidated experiences in several European countries demonstrate that the Logistics evolution requires continuous re-projecting of ad-hoc educational interventions, oriented both to human resources already hired inside companies, and to those yet to be inserted in working contexts.

With a particular reference to this last aspect, there is the necessity to reflect on educational contents and methodologies oriented to young students and workers, to give them fundamental tools to access and competitively remain in the labor market. This reflection has to be made in accordance with the EU indications in terms of enhancing quality of educational offer, and the recognition of the importance of Logistics for an adequate level of competitiveness.

As in other economical sectors, the evidence of a gap among the company requirements and the contents taught to higher education students highlights the necessity to search for a close integration among industrial and educational-academic areas (Andersen *et. al.*, 2011; Nakagawa *et al.*, 2011; Van Hoek *et al.*, 2011). A more effective dialogue among those two worlds could make it possible to activate continuous processes of implementation of learning capabilities and working competences. The key challenge is to identify and create those competences to promote innovation and competitiveness.

In addition to Universities, the role of Professional Associations is essential both to support Logistics companies in this evolutionary process toward digitalization, and to guide their choices with educational and knowledge-based instruments oriented to enhance the overall Logistics performance.

Under this lens, the preliminary phase of the Project presented the realization of a map of institutional education for the Logistics area, and the identification of the different competences of the sector.

In this context, the Project was meant to identify and develop tools and guidelines to harmonize the educational offer and professional qualification requirements, thinking about training courses oriented to teach not only specific Logistic competences, but also to promote the capability to open the perspectives to international contexts (Arvis *et al*, 2016).

The Project was composed by different phases, each one finalized to the creation of specific outputs aim at contributing to the overall research objective. The different Partners brought their experiences to encourage the implementation of an organic approach to obtain concrete applicative effects.

The first study presents a “Compendium of Good practices” (Chapter 1), which is a collection of case studies where a high level of collaboration among the identified actors is a central element. The identified case studies were selected on the basis of specific criteria: efficacy, effectiveness, and relevance of educational offer, Partnerships, replicability, socio-economical sustainability and local authority support. For each context, strengths, weaknesses, opportunities and threat have been identified, according to the SWOT analysis and multiple case study analysis methodologies (Stake, 1995; Yin, 2009).

Each case represents a specific context, and a relevant learning opportunity. Specific and multidisciplinary educational initiatives are important to encourage the development of professional profiles coherent with the required competences in the Logistic area by companies. This Compendium represents a significant basis to spread innovative approaches in educational programs for the area.

The second research output (Chapter 2, 3, 4, 5) is focused on several specific objectives. First, (Chapter 2,3) the definition of the theoretical and practical context in which the project was inserted in. The definition included a series of specific indicators deemed to represent evaluation criteria for measuring and enhancing educational offer quality in a collaborative orientation. This aspect is fundamental to facilitate a concrete and effective application of Knowledge Triangle at a European level. Secondly, on the basis of identified indicators, an online assessment tool has been developed, oriented to all the different actors of the Logistic

area which could be interested in the topic. As third objective, the identification of methods and instruments to reach defined objectives, from the critical analysis of the multiple case studies and the information highlighted in the following documents, were collected in the “FRAMELOG” (for a condensed and visual representation, see Annex 1, 2), to systematically encourage close interactions and communication among involved actors.

A clear communication of the challenges to face, and action lines to implement represents a fundamental element for the realization of the project aim. In this perspective, a Stakeholder Engagement Plan (Chapter 4) and a set of Guidelines for implementing the FRAMELOG (Chapter 5) were defined to identify roles and profiles to be involved and possible strategies to be implemented, for a real and effective implementation of the results developed in the project.

The third research phase generated an output (Chapter 6, 7) that is focused on the definition of an additional set of guidelines, more oriented to the quality assurance of results. The definition of this second set of accurate guidelines is oriented to the sustainable valorization of the obtained results, the possibility to face important evaluation challenges, and the quality assurance guarantee of the enacted actions to remain aligned with the European and national normative panorama on educational learning.

The fourth and last Output (Chapter 8) presents the collection of the evaluation reports of the complete set of Project outputs, developed after the several testing activities of Project results among key stakeholders at both national and European level. In this Chapter, key results, recommendations and possible critical elements are collected to orient further studies and activities on the topic.

The scientific Project outputs, thanks also to the international perspective adopted, might contribute not only to a deeper understanding of the necessary changes that academic and educational programs are called to implement for the Logistic area, together with some solutions to boost the creation of collaborative attitudes among key actors of the Knowledge Triangle in Logistics, but also to enrich the growing academic debate about the role of collaboration and of competences development in the turbulent environment of the Logistics.

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COMPENDIUM OF GOOD PRACTICES OF COLLABORATION AMONG HIGHER EDUCATION, RESEARCH AND BUSINESS IN THE LOGISTIC AREA

Kamelia Stefanova, UNWE

Dorina Kabakchieva, UNWE



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1. Introduction

The idea of the project “**FRAMELOG: European Knowledge Triangle in the Logistics Sector**” came out of discussions and analysis of European and national policies in supporting Knowledge Triangle implementation in order to assist the international, European and national targets related to logistic and chain management.

The FRAMELOG project *aims* at the development of the knowledge triangle by linking higher education institutions (HEIs), research organizations and business. Logistics and Supply Chain Management (L&SCM) are critical for all business sectors. They are also equally critical for not-for-business organizations which should be efficient and effective in their activities.

The consequences of heterogeneous implementation of the Knowledge Triangle in the logistics and supply chain management leads to limited transparency and mutual trust among the key stakeholders: HEIs, companies, research organizations. Therefore, that has a negative impact both, on the quality and relevance of the HEIs, and on the business competitiveness at European and national levels.

To be globally competitive, it is necessary to overcome barriers to university-business cooperation. Universities and companies need to better understand the benefits of cooperation. Regarding the Logistics and Supply Chain Management, there is a need to harmonize qualification schemes and certification of skills to make them more usable during the recruiting processes. Competences developed and taught by Universities should be acknowledged by the qualification systems adopted by professional associations.

The **FRAMELOG project objectives** are:

- **To support an academic offer** more in line with the qualification requirements of companies and professional qualification systems.
- **To improve the cooperation** among Higher Education Institutions (HEIs), business and research in logistics developing academic qualifications relevant for the labour market (Knowledge Triangle).
- **To enhance transparency and mutual trust** mechanisms for the recognition of the professional qualifications.

- *To foster the quality and relevance* of the Higher Education.

The *expected outputs* from the FRAMELOG project implementation include:

- *Compendium of good practices* in the field of Knowledge Triangle in HEIs;
- *European Framework for Knowledge Triangle* in HEIs in logistics (FRAMELOG);
- *Guidelines for addressing Quality Assurance and Assessment* challenges within the FRAMELOG;
- *European report* on testing and consultation activities.

The conducted needs analysis reveals that one of the important tools for supporting Knowledge Triangle implementation is to evidence its benefits for the stakeholders through examples of efficient implementation. Therefore, the “*Compendium of Good Practices in the Field of Knowledge Triangle in HEIs*” is the first research output from the project implementation and its objective is to *highlight examples of good practice in the field of Knowledge Triangle approach*, including details regarding the methodologies applied and results achieved.

The Compendium is also considered to be the basis for dissemination of the Knowledge Triangle culture in the academic sector for programmes in the field of Logistics and Supply Chain Management.

The Compendium of Good Practices is developed as a result of the performed research activities by all project partners. As a first step in the research, a methodology is defined, including criteria for collecting and selecting good practices, a good practice development framework and a template for the good practices description. In the second step, existing examples of good practices are analyzed and selected by all project partners, based on the agreed criteria and considered most relevant for the project objectives. After that, the selected good practices are described in a provided template based on the designed framework, thus ensuring the implementation of a methodological approach and achieving a common structure of the good practices to be included in the Compendium.

The “Compendium of Good Practices in the Field of Knowledge Triangle in HEIs” is organized in seven sections. The first section introduces the reader to the aim and objectives of the FRAMELOG project, and explains the importance of developing a Compendium of good practices – one of the project outputs. The Knowledge Triangle concept is explained in the second section. The third section provides the basic definitions used in the fields of Logistics and Supply Chain Management, and discusses the state-of-the-art and development trends in the European Logistics. The research methodology used for the Compendium development is presented in the fourth section and describes the conducted research activities, the criteria for the selection of good practices, and the good practice development framework. The identified good practices in the field on Knowledge Triangle in HEIs are presented in the fifth section and their analysis is provided in the sixth section. The final seventh section contains the analysis of the selected and presented good practices, and provides conclusions and recommendations that are useful for the interested stakeholders in the field of logistics. The template used for the good practices description is available in Annex 1, and the list of good practices extracted from the HEIs observed is provided in Annex 2.

2. The Knowledge Triangle – Context and Definitions

For the purposes of the Compendium, the following working definitions will be used:

Good Practice - A methodology or technique that, through experience and research, has proven to work well and reliably lead to desired results, and is therefore recommended as a model. It is a successful experience, which has been tested and validated, in the broad sense, and deserves to be shared so that a greater number of people can adopt it. Results can be partial and be related to only one or more components of the practice. Indeed, documenting and applying lessons learned on what does not work and why it does not work is an integral part of good practice so that the same types of mistakes can be avoided by other programmes and projects.

Knowledge Triangle – The knowledge triangle refers to the interaction between research, education and innovation, which are key drivers of a knowledge-based society. The recent shift towards open innovation has resulted in increased flows of knowledge and new types of cooperation between education institutions, research organisations and business. The European Commission supports investment in innovation and the knowledge triangle through the European Institute of Innovation and Technology (EIT) initiatives, the University-Business Cooperation and Supporting Entrepreneurship.

The Knowledge Triangle is defined as interaction of (higher) education, research and innovation that should contribute to increased growth and employment. This refers, in particular, to the multiple different relationships and knowledge flows between the actors performing these functions.

Knowledge triangles frequently feature a strong local component and are not only expressed in the close cooperation and exchanges of higher education institutions, research organizations and enterprises within a region, but also in the networks of relationships with political and social institutions.

3. Logistics & Supply Chain Management **- Context and Definitions**

This section explains the basic concepts used in the fields of Logistics and Supply Chain Management, and provides information about the commonly accepted definitions in the field, thus helping the readers to easily understand the presented good practices in the Compendium. The state-of-the-art and the development trends in European logistics is also briefly discussed, providing an overview of current practices, problems and challenges.

3.1. Basic Definitions

One of the most widely accepted definitions of **logistics** is that of the Council of Supply Chain Management Professionals - Logistics is that

part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of goods, services, and related information from point of origin to point of consumption in order to meet customer requirements (Council of Supply Chain Management Professionals, 2013). The focus on the material flows is also revealed in the definition of the European Logistics Association: the organization, planning, control and execution of the goods flow from development and purchasing, through production and distribution, to the final customer in order to satisfy the requirements of the market at minimum costs and capital use.

Due to the increased specialization of companies the present stage in the development of logistics is associated with the integration of a company's efforts with those of its suppliers, customers and intermediaries for coordinated management of materials and related flows. As a result of the evolution of logistics the concept of supply chain management comes forward since the beginning of 2000s. **Supply chain management** is the "planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies" (Council of Supply Chain Management Professionals, 2013).

The main participants in the logistics processes are extractive and manufacturing (processing) companies that produce the material flows, as well as the trading companies that distribute these flows. There are a number of other participants that facilitate the movement of material and information flows - *logistics service providers*, which include transportation, warehousing, freight forwarding companies among others. The set of logistics service providers operating within an economy forms **the logistics sector**.

Logistics services are a complex web of activities designed to ensure the efficient movement of raw materials, intermediate inputs, and finished goods between suppliers, manufacturers, and consumers (The U.S. International Trade Commission, 2005). They are quite different in

their nature. *Physical services* that require basic assets and some organizational skills, like storage, receiving and expediting, have the lowest complexity. *Value-added services* are all types of activity, which traditionally are not part of the basic transportation and warehousing services. These services may include:

- operations that add value to the product itself, changing the product and its functions (cutting, drying and other production customization activities, assembly, installation);
- services such as labeling, consolidation, adding promotional materials, etc., that do not change the product itself but rather prepare it as per customer requirements;
- services, which are related to the administration of the goods flow (freight forwarding, cargo insurance, customs clearance, tracking and tracing);
- services, which are related to the management of the goods flow (consultancy, inventory management, delivery planning and management, development and implementation of supply chain management solutions).

3.2. State-of-the-Art of the European Logistics

An extremely valuable source for international comparisons in the field of logistics is the Logistics Performance Index, published by the World Bank every two years. It has six components (indicators), including efficiency of customs and border management clearance, quality of trade and transport infrastructure, ease of arranging competitively priced shipments, competence and quality of logistics services, ability to track and trace consignments and delivery timeliness and reliability (frequency with which shipments reach consignees within scheduled or expected delivery times). The data in Table 1 reveals that in 2016 the European countries with high GDP per capita, led by Germany, reassert their positions among the top ten countries with the highest Logistics Performance Index, which also include Singapore (rank 5), Hong Kong (rank 9) and USA (rank 10).

Country	LPI 2016		LPI 2014	
	Rank	Score	Rank	Score
Germany	1	4,23	1	4,12
Luxemburg	2	4,22	8	3,95
Sweden	3	4,20	6	3,96
The Netherlands	4	4,19	2	4,05
Belgium	6	4,11	3	4,04
Austria	7	4,10	22	3,65
UK	8	4,07	4	4,01
Finland	15	3,92	24	3,62
France	16	3,90	13	3,85
Denmark	17	3,82	17	3,78

TABLE 1 - TOP 10 PERFORMING EUROPEAN COUNTRIES (SOURCES: THE WORLD BANK, LOGISTICS PERFORMANCE INDEX, GLOBAL RANKINGS 2014, 2016)

The European logistics market (including the EU28 countries) accounts for € 960 billion in 2014 as estimated by the Fraunhofer Center for Applied Research on Supply Chain Services in their Top 100 survey of the European Transport and Logistics Services (Fraunhofer Center for Applied Research on Supply Chain Services, 2015/2016). Germany is the largest logistics nation in the EU with a market volume of about € 235 bn, followed by France, UK, Spain, Italy, the Netherlands. These market volumes include all expenses for logistics services, i.e. the ones for outsourced logistics services that are performed by the logistics service providers of the EU countries, as well as the expenses for logistics activities carried out by the manufacturing and trading companies themselves. About 54% of logistics expenses are for logistics activities carried out in-house and the rest are logistics expenses for outsourced logistics services.

The “Top 100” market survey takes into account different types of logistics costs. In 2014 transportation costs account for 44% of the total costs followed by the warehousing and inventory carrying costs that have an equal share of 24%. Other cost categories include order processing costs (5%) and administrative costs (3%).

3.3. Development Trends in the European Logistics

Several trends in logistics and supply chain management reveal a number of major future challenges according to the publication of the German logistics association BVL International (Handfield et al., 2013). They can be summarized as follows:

- ***Customer expectations continuously increase and meeting them is the main logistics objectives.*** Anyway, as customers are becoming ever more demanding and critical, traditional measures often fail.
- ***Companies are forced to adopt network thinking rather than company thinking.*** Instead of considering themselves to be market players independent from others, companies nowadays have to collaborate with other members of their extended supply chain network both vertically and horizontally, and this often includes integration of their internal and external processes and systems.
- ***Increasing pressure from customers to reduce costs,*** which has become ever more difficult any further. Logistics costs play an important role in reducing overall company costs since they are larger than 8% on average for manufacturing industries. However, as many as 14% of the companies cannot estimate their logistics costs.
- ***Globalization leads to an increase in complexity.*** It often results in deteriorated delivery reliability as a measure of logistics performance mainly due to greater volatility and problems with infrastructure particularly in regions of growth such as Russia, Eastern Europe, India, and Africa.
- ***Talent shortages in logistics*** are considered one of the most important challenges in the coming years across all regions and sectors. They are seen at the operational as well as the planning and controlling level. Except with training and qualification programs these shortages can be overcome through cooperation with universities and research institutions.
- ***Volatility will continue to increase*** and will be a very important trend in the next five years. Volatility is associated with an increase of market turbulence on the supply and demand side amplified by the effect of the economic and financial crisis.
- ***Sustainability pressure in logistics increases.*** Green issues and

corporate social responsibility are part of the logistics strategy of a growing number of companies. However, companies are not certain how to deploy these strategies, especially in relation to measurement, evaluation and setting goals.

- ***Risk and disruption increase in the supply chains.*** It is essential for companies to mitigate internal and external risks and to manage the risk around demand and planning. Strategic frameworks and tools are needed for engaging the entire network in risk and disruptions management including the improvement of supply chain visibility.
- ***A growing need for investments in new technologies*** such as “big data” analysis tools that help with the comprehensive handling and connection of data to improve planning and control outcomes in the supply chains.

Companies should prepare themselves to deal with these trends and exploit them for acquiring clear competitive advantages. The appropriate strategies must involve cooperation not only with partners in the supply chain but also with other parties involved in the logistics process in the economy such as suppliers of logistics education and research, technics, software, consultancy.

References

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4. Research Methodology for the Compendium Development

The research methodology used for the Compendium development is presented in this section, including the conducted research activities, the criteria for the selection of good practices in accordance with the project objectives, and the good practice development framework which is designed in order to provide a methodological approach and a common structure for the good practices description.

4.1. Research Activities and Methods

The methodology for collecting and selecting good practices is defined in order to support the development of a Compendium of Good Practices in the field of Knowledge Triangle in HEIs. The methodology helps the project partners to:

- Select suitable existing good practices of Knowledge Triangle that could be implemented in logistics, based on the provided criteria;
- Describe the identified good practices based on the provided good practices development template;
- Develop new good practice examples based on the provided good practices development template.

The main research activities include:

- Collecting and selecting already available good practices in the field of the Knowledge Triangle approach.
- Collecting data and developing new good practices in the field of the Knowledge Triangle approach, based on the provided Good Practice Development Framework.
- Development of the Compendium of good practices – to be provided in electronic version, in English, and with a synthesis in BG, IT and RO.

The main research methods and tools that will be used for implementing the defined methodology include:

- Desk research
- Interviews
- Questionnaires

4.2. Criteria for selection of good practices in the field of Knowledge Triangle in HEIs

The good practices will represent examples of efficient knowledge triangle implementation in different HEIs that have applied different types of approaches and have different priorities. The objective is to select examples of good practices considered most relevant for the project. It is important to identify the priorities for implementation and that the good practices are consistent with the project objectives. The criteria for the good practices selection reflect the points of view of the project partners, as well as some aspects of the factors that were taken into account in the selection of the case studies used in a report by Technopolis¹. These criteria include the following:

Effectiveness

The practice must work and achieve results that are measurable. The possible indicators for measuring the impact of the practice can be grouped in the following areas:

- *Education*: diplomas, placements, number of collaborations/contracts between HEIs and companies for providing placements for students;
- *Research*: research projects conducted in partnership between HEIs and companies; number of companies participated in scientific conferences organized by HEIs, publications, prizes;

1. Jávorka, Z. (Technopolis) and Giarracca F. (Technopolis), Education in the Knowledge Triangle, DG Education and Culture Framework Contract 02/10 – Lot 1, Final report, 12 December 2012.

- *Innovation*: contracts, patents, spin-offs, jobs created, contributions to environmental and social challenges;
- *Indicators of input*: faculty staff, researchers, funding etc.

Efficiency

The proposed practice must produce results with a reasonable level of resources and time.

Relevance

Since logistics and supply chain management (L&SCM) make the explicit perimeter of the project, the proposed practice must address the priority of the implementation of the Knowledge Triangle in this field. It is important to collect experiences of specific initiatives which highlight the interdisciplinary nature of the topic and encourage the development of professional skills required in L&SCM by companies. The good practice should also reflect the European experience too, because most of the L&SCM techniques and projects are more advanced and widespread in Europe than in other parts of the world. (it can be referred to the Knowledge Triangle implementation in other areas too as an example of a good practice if only it can be disseminated / transferred to logistics).

The good practice can be related to the development of both learning outcomes and curricula, and should have a linkage with the National/Regional and/or European Qualification framework.

Partnership

The proposed practice must involve firstly the 3 main project target groups - HEI / Business / Research - plus other relevant stakeholders if possible. It should favourite the creation, development, improvement of partnerships between training institutions, research institutes, companies and policy makers. These relationships can facilitate young people to find a job and can respond to the actual needs of companies. While in principle the practice should be an example of integrating all three triangle groups, there may be different degrees to which this is explicitly done. The good practice therefore should ex-

amine the different ways this integration is represented in strategies and activities.

Possibility of duplication

While the proposed practice will reflect the specific framework conditions in which the HEI operates (legal status, funding, and governance status), the practice, as carried out, must be replicable at local / regional / national and European level and adaptable to similar objectives in varying situations. It could be difficult to transfer it to other contexts/situations. However, it can represent an important learning opportunity. The good practice should have the potential to be replicated in other institutions and in other countries with some adaptation to the local legal and institutional requirements. However, there may be some practices which could be transferable, but are more dependent on the institution's internal and external environment, but that should not lead to the exclusion of the case study as a whole.

Ethical Sustainability

The practice must be environmentally, economically and socially sustainable.

Political and economic commitment

The proposed practice must have support from the national or local authorities (e.g. authorities involved in the recognition and validation of VET qualifications) and should be well integrated in the local or regional economy. It may be part of a wider local or regional activity, supported or initiated by local authorities and including partnerships with other education/research bodies and companies.

Each selected good practice should meet at least the first three criteria of effectiveness, efficiency and relevance, in addition to one or more other criteria.

4.3. *Good Practice Development Framework*

The proposed Good Practice Development Framework provides a methodological approach for the description of the identified and selected good practices in the field of Knowledge Triangle in HEIs.

The Good Practice Development Framework proposes a common structure for the description of the good practices that will be included in the Compendium, with the following sections:

- Introduction
- Parties involved in the Knowledge Triangle
- Integration of Education in the Knowledge Triangle
- Collaboration with External Partners
- Main Challenges, Key Success and Enabling Factors
- Future Developments and Transferability
- Lessons Learnt and Recommendations
- Contacts and References

The ***Introduction*** section would contain information related to:

- National and Regional framework/context
- University establishment
- Organizational structure and Governance
- University research and education

The ***Parties involved in the Knowledge Triangle*** section will contain description of the participants in the knowledge triangle – representing Higher Education, Research and Business.

The ***Integration of Education in the Knowledge Triangle*** section would contain information about:

- Drivers of the Education Model
 - mission, vision, values
- Specific education initiatives
 - New interdisciplinary and experimental approach to education
 - Development of a competency based approach to curriculum design
 - Ensuring the quality and relevance of education, research and technology transfer activities through Quality Assurance

- Entrepreneurship education
- Flexible PhD programmes
- Professorships for scientists
- Shared professorships and associate lecturers from industry
- Internships
- Dual programme combining study and work experience
- Vocational Higher Education
- New interdisciplinary research centres
- Student Incubators
- Talent development
- Internationalisation of science and education
- Strategies and support systems for the knowledge triangle
 - Dedicated governance initiatives
 - Support system for collaboration with external partners
 - Dedicated university offices for cooperation with external partners
 - Innovation support

The ***Collaboration with External Partners*** section should contain information about:

- Extensive university-research-industry partnerships
 - Collaboration in the field of education
 - Mobility
- Strategic cooperation agreements with industry
 - Research collaboration / Innovation Centres
 - Competence centres in collaboration with industry
 - Doctoral Schools for Research & Innovation
 - Science Parks
 - Innovative technologies used
 - Regional Development Centre

The ***Main Challenges, Key Success and Enabling Factors*** section might include information concerning:

- Local context and national reforms

- A decentralized approach to partnerships inside each institution
- Shared social mission between universities and enterprises
- Merger and common operating models, collaborative infrastructures
- Culture and accountability
- Project based cooperation

The ***Future Developments and Transferability*** section should provide information about the planned future steps and the possibilities to transfer the experience to similar settings.

The ***Lessons Learnt and Recommendations*** section should discuss the conclusions drawn about what works or does not work and why, and provide recommendations in order to help avoid the same types of mistakes.

The ***Contacts and References*** section should contain a list of the interviewees (e.g. name, position, affiliation) and the list of references.

The provided guidelines about the sections content are provisional and should serve as a basis for collecting all the available information for the good practice examples description.

Each project partner is expected to select and describe 2 (two) good practice examples in the field of Knowledge Triangle in HEIs.

A ***Template*** for the Good Practice description is provided in Annex 1 to this document, in order to ensure the readability and the clear presentation of the strengths of the practices proposed and their comparability.

5. Selected Good Practices in the Field of Knowledge Triangle in HEIs

The twelve good practices presented in this section are described by using a provided template (available in Annex 1) and are based on the designed good practices development framework presented in section 4.3. The information is either collected from available publications, or described based on interviews conducted with representatives of the involved institutions.

5.1. Zaragoza Logistics Center (ZLC), SPAIN

Section 1: Introduction

1.1. National and Regional Framework/Context

The Zaragoza Logistics Center (ZLC) is an international center for education and research in logistics and supply chain management, situated in the heart of the largest logistics park in the southwest of Europe (Plataforma Logística de Zaragoza – PLAZA), Zaragoza (capital of the autonomous region of Aragon, Spain). The need to foster logistics innovation is seen as being the main impetus for the launch of ZLC. Recognizing that the region can achieve an unprecedented economic growth through transforming the Zaragoza's area into a leading logistics center, the Government of Aragon has decided to unlock this potential. In the early 2000s two significant government initiatives were inspired in this direction – creation of PLAZA and ZLC. ZLC, besides its assigned role to actively contribute to the innovation in the Aragonese region, is the major center of education in the field of logistics and supply chain management there. Thus, this creates such an environment that supports integration of all three knowledge triangle groups – research, education and innovation. Additionally, the close proximity of ZLC to the companies located in PLAZA contributes to the integration as it physically strengthens these relations (academia, industry and society) and intensifies flows of knowledge between them. Thus, while the PLAZA's companies are subject to various experiments of the ZLC's researchers and students, they can gain access to state-of-the-art research, innovative ideas and young talents.

Although the center was established primarily for the purpose of enabling the innovation at the local level, few years after launching, ZLC has extended its activities to the national level. The most convincing evidence of this is the fact that ZLC has been designated to be the lead center of the National Integrated Logistics Competence Center (CNC-LOGISTICA), established by the Spanish Ministry of Education and Science in accordance with the National R&D and innovation plan 2004-2007 in early 2006. ZLC's responsibilities are related to defining and coordinating research, development and innovation initiatives in

the field of logistics and supply chain management across Spain. After two years later, due to successful performing the role in bridging the gap between academia, industry and society, ZLC has been officially recognized as a Knowledge Transfer Office (KTO) by the Spanish Ministry of Education and Science. Furthermore, in 2014 ZLC was selected along with 50 other entities by the Centre for the Development of Industrial Technology (CDTI – National Innovation Agency in Spain) to support the participation of Spanish companies in the Horizon 2020.

Even though the ZLC's launch was mainly an initiative of local stakeholders (the Government of Aragon and the University of Zaragoza.), ZLC receives strong support from different national and international institutions (the Spanish Ministry of Education and Science, EU and MIT). Additionally, ZLC's activities are supported by the local saving bank Ibercaja and the European Social Fund.

1.2. HEI Establishment

The Zaragoza Logistics Center (ZLC) was established as a research institute of the University of Zaragoza by the Government of Aragon in Spain in partnership with the Massachusetts Institute of Technology (MIT) and the University of Zaragoza. The main purposes, for which ZLC is created, are: research and education in the field of logistics and supply chain management; knowledge transferring and developing to support the PLAZA's and regional economic growth; cooperation with University of Zaragoza. In order to realize its strategic plan for accelerating regional economic growth, the Government of Aragón signed a 10-year agreement with MIT Center for Transportation and Logistics in 2003. By this act, the parties involved are committed to work as partners towards developing a world-class education and research in logistics and supply chain management. The agreement was renewed in 2013 for a further term of 10 years.

1.3. Organizational structure and Governance

Zaragoza Logistics Center (ZLC) is a private foundation of public initiative, managed by a board of trustees. According to the latest Annual Report of the ZLC foundation the board of trustees comprises

representatives from the Government of Aragón, University of Zaragoza, Massachusetts Institute of Technology (MIT) Center for Transportation and Logistics, and the local saving bank Ibercaja. Here it is important to note that such an involvement in HEI's governance can facilitate the alignment of research and educational activities with the needs of society and business which is at the base of the knowledge triangle concept.

The organizational chart of the ZLC shown below (Fig. 1) illustrates that the foundation has a centralized system of governance.

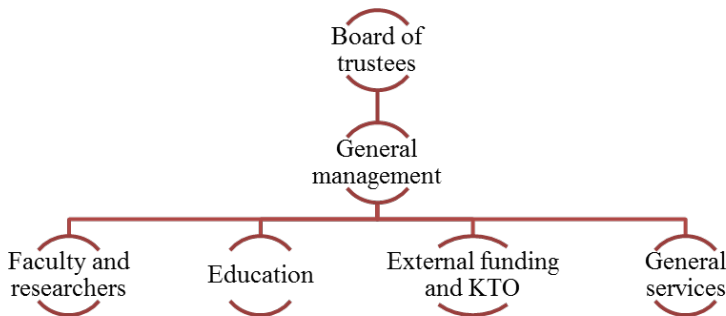


FIG. 1 - ORGANIZATIONAL STRUCTURE OF ZLC

As illustrated above, ZLC has a dedicated unit for knowledge transfer – Knowledge Transfer Office (KTO), which was officially recognized by the Spanish Ministry of Education and Science in January 2008 with reference number 218. This means that ZLC uses one channel for knowledge transfer activities, allowing more control of them.

In terms of source of financing, the Foundation derives income from educational activities and from subsidies and donations received from individuals or entities, both public and private. In 2015, ZLC's income

amounted to €1,972 thousands². Almost ½ of it is derived from tuition fees and from other activities related to education, while the remaining is from subsidies (47%), scientific research and technological development (3%) and collaboration agreements with industry (2%). The grants awarded by European Commission represent the largest share of ZLC subsidies (56%), while the rest of them are from the Government of Aragón (44%). The grants received by EC are designated for 11 research projects. Additionally, ZLC has so far received financial support from Bill and Melinda Gates Foundation, Rockefeller Foundation, Renfe Operadora (RENFE) etc. It may here be worth mentioning, that a grant of almost half a million US dollars was awarded by the Bill and Melinda Gates Foundation in 2009 that is designated for developing a forecasting methodology for global health products demand.

The presented data above shows that ZLC has very diverse funding structure, which allows reducing HEI's dependence and decreases risks for financial stability. Moreover, a positive fact is the rising of the collaboration agreements between ZLC and the industry by 34% in 2015 compared to 2014. All of them except one are directly linked to educational activities (sponsoring ZLC students' thesis projects), so their contribution is counted as an income from educational activities. The other agreement represents the highest level of the ZLC's corporate program (described below in detail) which is exclusive in terms of partner's rights provided – funding a professorial chair to access pioneering results from a research.

1.4. HEI research and education

ZLC is a small-sized HEI carrying out educational and research activities only in the field of logistics and supply chain management. The narrow scope of its activities allows ZLC to achieving leadership in the field due to specialization, allowing developing greater expertise and competence. In 2016 ZLC had 13 full-time faculties and researchers, while the part time adjuncts/visitors were 53. They are alumni of some

2. Fundación Zaragoza Logistics Center – Cuentas anuales abreviadas (2015): <http://www.aragon.es>.

of the most prestigious universities in the world and have extensive industry experience ranging from start-ups to large multinationals in a wide variety of industries. Thus, this makes ZLC more attractive for candidates as well as for business in terms of cooperation (education, research and innovation). For the past 13 years ZLC has enrolled more than 1900 students from 59 countries in ZLC's programs. Currently it has 53 students in master's degree programs and 4 PhD students, and the average number of students enrolled in these programs is about 47 per year (excl. PhD students)³. From the beginning of 2016/2017 academic year till now 138 professionals have participated in different ZLC's executive programs (29% more than the participated professionals in the previous academic year). It should be kept in mind, however, that this percentage is likely to increase because the current academic year is not yet over. The above data illustrate that ZLC focuses primarily on:

- Attracting of individuals that are highly motivated and with extraordinary potential in the field of logistics and supply chain management due to admission of limited number of students;
- Executive education because it can contribute to the future enlargement of the ZLC's network partners or is a result of partnerships that already exist.

Organizationally, the ZLC's research activity is performed by nine research groups. Each of them concentrates its efforts in the following research areas: Behavioral Supply Chain Management; Supply Chain Security and Risk Management; Supply Chain and Finance; Inventory Management; Transport and Urban Mobility; Logistics Clusters; Green Supply Chains; Global Health Supply Chains and Humanitarian Logistics; Manufacturing and Logistics Analytics.

In order to achieve excellence in research ZLC collaborates with Aragon's regional university and government, industry partners and leading universities worldwide in the field such as Massachusetts In-

3. The calculation of the average is based on 10 consecutive academic years (2016-2017 inclusive) of admitted students data,

stitute of Technology. ZLC has so far involved more than 325 partners around the world in its research activities and has developed more than 100 R&D projects in the field of logistics and SCM in collaboration with regional, national and international industry. Generally, four distinct groups of research in terms of its coverage level are identified: local; national; European and global. Most of the currently in progress research projects are European Union funded. Till now ZLC has participated in 20 European Union funded projects, being ranked as the Spanish entity with most EU funded projects in the field of logistics. In 2016 ZLC has been awarded 5 new European funded research projects: INSPIRE, MOBILITY4EU, LEARN, SELIS and AGROinLOG. The topics covered by the ZLC's European funded research projects are predominantly in the field of transport. Some of them involve large national and multinational companies. For instance, Procter & Gamble, DHL and BSH are some of the demonstrators in CORE project that will validate the applicability and benefits of the approach developed by the project partners, for whom the ZLC is taking a leading role.

Apart from those projects which are publicly funded, there are some private funded research projects. The number of private funded research projects is higher than in the previous year (7 in 2016 compared to 2 in 2015). The following companies have funded research projects at ZLC in 2016: Carreras, Clariant, Entercoms, Project Group, IRU, P&G and IC business group (INCLAM).

Since 2006 more than 90 publications are produced. In 2016, total of 12 publications were found, all dealing with the following hot topics areas: inventory management models, methods for estimating logistics carbon emissions, supply chain security, supply chain finance, etc. They appear in prestigious international journals in the field such as: *Productions and Operations Management*, *International Journal of Physical Distribution and Logistics Management*, *Transport Policy*, etc.

In terms of education ZLC focuses only on postgraduate education in logistics and supply chain management. ZLC offers an international master's degree (ZLOG) and PhD degree, master degree in Spanish (MDSC) aimed at upgrading both knowledge and skills of the local workforce (employees from companies established in PLAZA and

across the region) and various executive programs. Although that all ZLC's graduate programs are designed for students who have several years of work experience the target group of students is diverse. Thus, ZLOG and PhD programs attract predominantly international students due to both first-rate recognized education (ranking) and the fact that the programs are modeled on a on MIT Supply Chain Management Program. MDSC and executive education programs attract professionals from the companies in the Aragonese region and mid or senior level managers or executives working in Supply Chain related areas. All the degrees offered by ZLC are taught in English excl. MDSC, as a result it has attracted many students from abroad – only 24% of ZLOG students in 2016-2017 are from Spain while the remaining 76% are from outside the country (representatives of 13 other countries around the world).

The graduate education includes two master (ZLOG and MDSC) and one doctoral degree programs. The executive education includes various customized programs for individual enterprises and consortia.

The MIT Zaragoza Master of Engineering in Logistics and Supply Chain Management (ZLOG) is an international, ten-month, full-time degree program, modeled on MIT Supply Chain Management Program (SCM). The program is created in 2004 in collaboration with the leading university in the field, the Massachusetts Institute of Technology (MIT), which has consistently been ranked #1 by US News and World Report. In 2016 ZLC's education for the MIT Master in supply chain management has been ranked as the number one in Spain (El Mundo's ranking), which recognition has already received for six consecutive years (since 2011), and ranked #1 worldwide along with the rest of MIT Masters, provided in the MIT SCALE centers in USA and Malaysia ("Eduniversal"). Further, in 2016 ZLC has been ranked by SCM World's Top 100 University Ranking as the best university in Spain and #10 in Europe specializing in supply chain management. Curriculum emphasizes analytical problem solving, leadership, and communication skills. Students must complete core and elective coursework, a master's thesis, and participate in the international exchange. The program structure is based on four building blocks (terms/phases): Orientation Period (team building and career workshops; preparatory sessions: basic analytical skills); Sys-

tems and Methods (fundamental theory on SCM and logistics); International Exchange at MIT campus, USA (theory into practice) and Strategy and Specialization (Supply Chain Strategy and Network Design, System Dynamics, and Final Thesis Project). Graduates receive Master of Engineering in Logistics and Supply Chain Management from the University of Zaragoza and Graduate Certificate in Logistics and Supply Chain Management from the MIT Global Scale Network.

Master in Supply Chain Management (Máster en dirección de Supply Chain – MDSC) is a 9-month, part-time program taught in Spanish, that prepares senior professionals the field of supply chain. The program aimed at upgrading capabilities of the local workforce. More than 80 percent of MdL students at the ZLC come from Aragon and more than 85 percent of MdL alumni work in Aragon companies, i.e. the course is predominantly intended for professionals working within and outside the park. The sessions (educational methodology) combine various formats, such as business case discussions, lectures, simulation games and exercises, supplemented by expert talks and business visits. The program's schedule is compatible with the work activity (taught three days a week in the afternoon). Graduates receive Master in Supply Chain Management from the University of Zaragoza.

Currently, the MIT Zaragoza PhD Program has an international student body of doctoral students from all different continents. This full-time program is co-funded by the European Social Fund, enabling graduates to take faculty positions at leading universities around the world or to become innovation leaders for international companies. The main aim of the PhD Program on Logistics and Supply Chain Management is to develop outstanding scholars who will pursue distinguished careers in research and education. Students work intensively with ZLC faculty to create new knowledge in fields of interest such as supply chain coordination, inventory management, supply chain finance, supply chain risk management and security, and supply chain innovation. PhD students complete the necessary coursework during the first two years. Specifically, during the first year, students take doctoral level courses offered at ZLC, while they typically spend the second year at MIT. Some examples to such courses are probability and stochastic processes, em-

pirical methods, integer and dynamic programming, inventory management and game theory. Each student is required to take and pass the qualification exam at the beginning of the third academic year in order to become PhD Candidate. They are also expected to submit a proposal for the dissertation during the fifth semester. The last two years are dedicated to research, and students are expected to finish their dissertation work by the end of the fourth academic year. Official PhD degree awarded by the University of Zaragoza. Graduates also receive a certificate from MIT.

ZLC offers customized executive education programs (2-5 intensive) for companies to fulfill their specific learning needs and allow their teams to be more effective in the day to day work. The target group is mid or senior level managers or executives working in Supply Chain related areas. ZLC programs combine the various methodologies in the corresponding matter, based on the concepts that support it, complemented with practical cases, simulations and discussion groups. ZLC's programs include visits to the most advanced facilities and operations of ZLC partner companies. All the professors in ZLC's faculty and instructors have received first level education at international level, bring wide experience in teaching executive programs and reach the highest evaluation levels. The executive education courses leading to MIT SCALE certificates in various logistics-related disciplines. One of the executive programs ("Leading your value chain transformation") is based on a strategic partnership agreement between ZLC and Accenture. The program is taught in English. The target participants are mid or senior managers with at least five years' experience in supply chain and logistics relevant business areas or in cross functional areas like Finance, Marketing, IT/Digital, Entrepreneurs or General Management. The courses occur only in weekends (12 days in total), they combine experiential learning including lectures, cases, simulation games with work on an applied project. The aim of the applied projects is to optimize the value chain of the participating companies, implementing the tools and techniques learned during the course. Each project is mentored by a tutor from either ZLC or from Accenture Strategy. Participants receive certificate issued by ZLC-MIT and sponsored by Accenture Strategy.

Section 2: Parties involved in the Knowledge Triangle

Various parties are involved in the Knowledge Triangle – ZLC, University of Zaragoza, government of Aragon, Spanish Ministry of Education and Science, Massachusetts Institute of Technology (MIT), Ibercaja and EU, students and industry. ZLC maintains close institutional relationships with the University of Zaragoza (ZLC is a research institute that is attached to the University of Zaragoza). Both regional (government of Aragon) and state administration (Spanish Ministry of Education and Science) are also involved in KT, as they show the direction for regional and national R&D, innovation and education. All these parties collaborate with MIT in the development of educational activities at ZLC. Among the actors involved in KT, the private sector plays a special role, predominantly represented by the companies from PLAZA S.A. Their role as participants in KT can be viewed from different perspectives: as a research subject (ZLC's researchers and students can carry out various experiments using companies as a working laboratory); as a beneficent (access to research, training, innovations and talents in the field); as a financial contributor, and as an instructor. Also, Ibercaja and EU play a major role in this respect as facilitators of KT (funding of the research/educational activities). Students are other participants in the KT. Although the aspirations and goals of the parties involved in the KT may differ, this cooperation between them results a win-win situation for all of them.

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

The main purposes of the ZLC's creation⁴ can be directly addressed to the three dimensions of the KT: education, research and innovation: „research and education in the field of logistics and supply chain management; knowledge transferring and developing to support the

4. They are stated in the Act establishing the ZLC: DECRETO 263/2003, de 21 de octubre, del Gobierno de Aragón, Por el que se autoriza la constitución de la Fundación Zaragoza Logistics Center.

PLAZA's and regional economic growth; cooperation with University of Zaragoza". Therefore this should be regarded as the primary driver of KT and is incorporated into HEI's mission that is "to create an international center of excellence for research and education in logistics and supply chain management that actively engages with industry and the public sector to develop and disseminate knowledge". This means that in order to become a favourable partner in research and education and to be one of the globally leading HEI in the field of supply chain management and logistics, ZLC strategy should be focused on applying such practices that address both the excellence and the three dimensions of the KT: education, research and innovation. The collaboration between ZLC and MIT Center for Transportation and Logistics in developing the MIT-Zaragoza Logistics (ZLOG) program is one of the key enabling factors in accomplishing its mission, because it provides a unique educational model combining challenging coursework, cutting edge research, and industry interaction. This successful partnership led to the creation of the MIT Global SCALE Network that now spans four continents. The SCALE Network allows faculty, researchers, students, and affiliated companies from all MIT Global SCALE centers to "pool their expertise and collaborate on projects that will create supply chain and logistic innovations with global applications, and help companies to compete in an increasingly complex business environment"⁵.

3.2. Specific Education Initiatives

New experimental approach to education

ZLC has a strong focus on applying experimental approach as can be seen from the apparent number of the experimental studies conducted by the ZLC's students, based on ZAP Program (more details are presented below), and from the regularly provided industry sessions to students (representatives from various companies are welcomed to present their

5. The MIT Global Supply Chain and Logistics Excellence (SCALE) Network: <http://scale.mit.edu/centers>.

company's operations to ZLC's students). Moreover, students visit various manufacturing facilities and distribution centers during its international exchange at MIT campus in Cambridge, Massachusetts, which is part of the ZLOG's curriculum. Additionally, different industry speakers are exposed to them at that time (in Sect. "Internationalisation of science and education" more details are presented with respect to this practice).

In terms of experimental studies, students are required to carry out thesis projects. In order to facilitate and support the conducting these research projects ZLC has established a special program in 2008 – Zaragoza Academic Partner (ZAP) program. There are two main purposes for establishing this initiative: fostering applied research in the field of supply chain management and increasing and enhancing academia-industry interactions. The benefits that ZAP program brings to ZLOG students and industry are: students have the opportunity to develop their thesis on real-life supply chain problems, working together on concrete issues with industry professionals; businesses have the opportunity to interact with a student or student team along with an experienced researcher (professor) as expert thesis advisor who together bring new insights and approaches for optimizing supply chain and logistics processes. Also, it provides the company with a recruiting opportunity for new talent. Until now nearly 50 companies have participated in this program, among them some of the 2016 Gartner Supply Chain Top 25.

The process of developing research projects under the ZAP program is organised in six phases⁶:

- Project definition: The participating company selects a project topic before the start of the academic year. In order to properly define the project scope and description, participating company interacts with MIT-Zaragoza faculty members.
- Presentation of potential ZAP projects: During "Orientation Period" the potential ZAP projects are presented to students. To that end, the ZLC encourages companies to present their project in person through company presentations.

6. ZAP program: <http://www.zlc.edu.es>.

- Bidding procedure: The students bid on the projects and then thesis projects and advisors are assigned.
- Project plan formalizing and resource requirements defining: A meeting shall take place before starting the project in order to formalize a project plan and define resource requirements.
- Regular student-company team meetings: During the fall semester up to early spring of the same academic year student-company team shall meet periodically to work on the relevant research project.
- Presentation of thesis results: All students shall present their thesis results at the ZLOG Research Fest at the end of May. All partner companies are invited to attend ZLOG Research Fest. Samples of the completed master thesis are publicly available in the MIT Zaragoza Master of Engineering in Logistics and Supply Chain Management (ZLOG) Research Journal in the form of thesis executive summaries. The articles are intended for a business, rather than an academic audience. Thus, ZLC promote its students to business.

Ensuring the quality and relevance of education, research and technology transfer activities through Quality Assurance

ZLC has a Technology Watch System under the UNE 166006 standard⁷, certified by the AENOR – Spanish benchmark certification agency. This initiative for AENOR certification is called for by the agreement between ZLC and the Government of Aragon to promote internationalization and technological advancement in the Aragonese companies in accordance with the objectives of the II Regional Plan for Research, Development and Transfer of Knowledge of Aragon. The system allows the ZLC to systematically observe of and search for signs of change and innovation in the field of Logistics and Supply Chain Management that focuses on capture of information to convert it into knowledge that enables strategic decision making. Thus, ZLC can transfer knowledge

7. <http://www.aenor.es>.

to its stakeholders, which benefits industry, Aragon administration and society and outside its community.

Flexible PhD programmes

PhD candidates at ZLC have the opportunity to combine their studies at ZLC, MIT and Harvard simultaneously. Thus, PhD students benefit from gaining multicultural academic and research experience in both the EU and the US. Moreover, their participation in MIT SCALE Network provide a multi-continent experience (MIT Global SCALE Network spans four continents). A reasonable financial aid scheme is available in order to help the PhD students. The scheme covers the tuition and provides students with monthly stipends for 4 years. In return, students are expected to serve as: Teaching Assistant (TA) in ZLC Master Program and as Research Assistant (RA) in related projects. Some research projects might be available for students to work on for extra payment. For instance, representative from Procter & Gamble, SNIC Supply Network Innovation Center, works closely together with ZLC on the progress of the PhD Sponsorship.

Vocational Higher Education

ZLC focuses on executive education courses designed and taught by ZLC and MIT SCALE faculty for diverse organizations. ZLC organizes regular seminars with companies and organizations to provide customized executive education experiences to individual enterprises and consortia. With the principal aim of meeting the specific needs of the respective organizations, ZLC provides the opportunity to focus intensively on specific issues vital to company goals. Some of the participant companies in ZLC Executive Education Programs: Samsung, Maersk, HP, Oracle, Clariant, Accenture, Novartis etc.

One of the executive programs (“Leading your value chain transformation”) is based on a strategic partnership agreement between ZLC-MIT and Accenture, aims to train managers and executives in business strategy with focus on value chain transformation in a digitized network. The program modules are conducted jointly by the ZLC’s facul-

ty and by practitioner professors, holding key positions in the field of logistics and SCM (experts and managers) in leading companies such as DHL, Accenture, Accenture Strategy Consulting and Privalia, e-commerce leading company with presence in Spain, Italy, Brazil and Mexico.

Talent development

Talent development is a part of ZLC leadership. More than two thousand supply chain executives worldwide have recognized ZLC as a “TALENT HUB FOR SUPPLY CHAIN”, thus ZLC has assigned it as its slogan. PhD and Master graduates’ high caliber is validated by the positions of responsibility they hold. PhD graduates have joined high-profile institutions in Belgium, Canada, Dubai, Panama, The Netherlands and USA as teachers or researchers. The talent of the students in master programs is recognized by the most reputable companies in the world such as Apple, Amazon, Clariant, Pfizer and Roche among many others. The programs meet the high demand for a new type of supply chain leader, lead to great job opportunities in top companies. ZLC graduates of part-time program (100% placement rate within 3 months after graduation) have the highest rates of employment after graduation compared with graduates from full-time degree program (95% placement rate within 6 months after graduation). This is not surprising given that the majority of part-time graduates held their jobs while attending courses and continued working for the same employers after graduating. Additionally, it is worth noting that graduates of part-time program, which is taught in Spanish, hold positions predominantly in local companies, while the graduated students of ZLC-MIT program work around the globe for leading manufacturers, retailers, consultancies, and more. The positions accepted in these organizations range from Network Design and Optimization Manager to Supply Referent, Global Surgery Business Improvement Analyst, Senior Business Intelligence Engineer, Digital Learning Engineer, Demand Planner, Associate Consultant, Logistics Manager, Manager- Delivery Operations, Logistics Junior Consultant or PSC Category Procurement Leader.

Internationalisation of science and education

Concerning the internationalisation of science and education ZLC has strong focus on establishing partnerships with foreign universities and on fostering the mobility of students. Moreover the internationalisation is fostered through the ZLC's programs that are modeled on MIT programs and graduates receive two diplomas at the time of graduation (one from ZLC and the other from MIT Global Scale Network), thereby attracting students from all over the globe. All the degrees offered by ZLC, excl. MDSC, are taught in English which is the cornerstone of internationalization of education. ZLC (faculty, researchers, students, and affiliated companies) as a part of the SCALE Network is allowed to pool its expertise and collaborate on projects with the rest of centers of the MIT Global SCALE Network. In 2015 ZLC has been awarded by the European Commission with The Erasmus Charter for Higher Education (ECHE) for the full duration of the Program (2014-2020), allowing ZLC to participate in Erasmus+ and in learning mobility of individuals and/or cooperation for innovation and good practices under the Program.

In terms of partnerships with foreign universities ZLC offers various dual degree programs with some of the top business schools such as IE Business School (Spain), European Business School (Germany), INCAE (Costa Rica), Sabanci University (Turkey), USAT (Peru) and Feng Chia University (Taiwan). A strategic partnership between Bergamo University Italy and Zaragoza Logistics Center is developed with respect to joint PhD program in Logistics and Supply Chain Management. The program is designed and taught by the MIT-Zaragoza Program at ZLC and the Department of Economics and Management of the University of Bergamo. This degree has the collaboration of the Bocconi University, the leading University in Economics and Management in Italy and one of the top in the world. During each academic year, PhD candidates (from both the University of Bergamo and its partner the Bocconi University) will attend courses and seminars at the MIT-Zaragoza PhD program at ZLC. In addition to this, faculty members from these institutions will conduct joint research projects in logistics and supply chain management related issues that will enable the internationalization of science.

ZLC's annual PhD Summer Academy is another initiative for internationalizing science and education. Every year selected students and scholars from universities all over the globe participate in this initiative conducted in two weeks in summer, covering advanced topics in SCM. In 2017 will be the tenth time that the PhD Summer Academy has been held. Each year professors from prestigious academic institutions take part. The instructors at the forthcoming 10th summer academy are from: Instituto de Empresa, Spain, Ivey Business School, Canada, Pennsylvania State University, US and University of Texas at Dallas, US.

Apart from the above, ZLOG students have the opportunity for International Exchange at MIT campus in Cambridge, Massachusetts, which is part of the ZLOG's curriculum. Every January for a three-week period students from all of SCALE Network's centers engaged in master's programs come to MIT for an intensive IAP (Independent Activities Period) program of classes, tours, competitions and workshops. The IAP program offers a unique platform for networking internationally diverse group of students, thus, it creates a prototype of international working environment that has become the norm in the area of supply chain management. Throughout the three weeks of IAP, there are lectures by faculty on various supply chain issues and visits to manufacturing facilities and distribution centers. During the period some competitions take place – APICS Case Competition (organized by the Boston APICS chapter) and Fresh Connection (a supply chain simulation game). Thus, IAP program helps students to see the link between theory and the practice and deepen their knowledge. The third week ends with Research Expo, when all SCALE students present the progress of their real-world supply chain projects they are working on (thesis projects). The event is open to the supply chain community, bringing a number of companies and professional organizations, reinforcing the event's strong links to industry. At the end of the event, a panel of judges selects the best posters and prizes are presented.

3.3. Strategies and Support Systems for the Knowledge Triangle

Dedicated university offices for cooperation with external partners

In order to ensure smooth coordination between the different initiatives related to the knowledge triangle ZLC uses one channel for knowledge transfer activities. ZLC, as illustrated in Fig. 1, has a dedicated unit for knowledge transfer, which is designated to control the corresponding knowledge transfer activities – Knowledge Transfer Office (KTO). The KTO's activities include the following⁸:

- Promotion of ZLC's research output and know-how to both private and public sectors
- Coordination of knowledge transfer activities conducted by ZLC stakeholders
- Support for research policy formulation and strategic planning at ZLC
- Support services for the obtainment and management of external research grants schemes, including funding allocation, monitoring research progress and expenditures
- Focal point for internal research information dissemination and external liaison
- Development and maintenance of a central database for research activities
- Intellectual property protection and management

Additionally, ZLC has a full time staff person dedicated to helping the students find excellent jobs and organizing companies' visits to ZLC Campus. During these visits companies present their company's operations, interact with students and/or conduct interviews. So far, more than 40 companies have had the opportunity of conducting a master class and giving their company presentation. Although the majority of corporate presentations and interviews take place between January and March, ZLC hosts companies throughout the academic year. Companies also have the option of doing online events to connect with the cur-

8. Zaragoza Logistics center website: <http://www.zlc.edu.es/about-us/kto/>.

rent class. Additionally, ZLC makes a detailed profile of its current class in terms of students' research interests, nationality, average age, gender, areas of graduation, average GMAT scores, years of experience, etc. This profile is accessible in ZLC web, allowing companies to review in advance the profile of potential employees.

Support system for collaboration with external partners

In addition to the dedicated unit for knowledge transfer, the collaboration with external partners is supported by the various events, organized by ZLC, where experts from all over the world shared their insights, practices, models, even reservations about the way ahead.

Since 2015 ZLC have organized the Global Supply Chain Research Forum that encompasses two events: the Research Fest, where final students' research projects are presented, covering a range of topics focused on logistics and supply chain management; and the Research Panel Discussion, where companies and researchers have an opportunity for networking and discussing about the latest research trends in logistics and supply chain management applied to real life success cases. The Research Panel Discussion provides an opportunity to jointly reflect on the latest research applications in logistics and SCM. MIT-ZLC's faculty members present the latest research topics applied to real life success cases to a select number of special company partners and guests. Thus companies and researchers are able to have discussions and open their minds to new ideas, trends and topics in supply chain, find new insights and at the same time provide new ground for research in those areas.

Moreover, ZLC has intensive Alumni interactions, which give an opportunity for formation new collaboration agreements with industry. ZLC together with industry partners support various Alumni events. These events present meetings/workshops, organized by ZLC alumni. For instance, every year the Basel ZLOG Alumni, who are currently working at pharmaceutical and chemical companies in the Basel area, organize workshop, where various companies and academia can share best practices and experiences in the area of supply chain. In addition to

this event, the Basel ZLOG Alumni Group is also “committed to financially supporting a talented student in achieving his/her supply chain dream every year”⁹ (Alumni Scholarship).

Section 4: Collaboration with External Partners

ZLC has developed various mechanisms for collaboration with external partners – through ZLC’s Research Groups, ZLC’s Corporate Program, and the Global Supply Chain Research Forum etc.

4.1. Extensive university-research-industry partnerships

Collaboration in the field of education

As was mentioned above one of the executive programs (“Leading your value chain transformation”) is based on a strategic partnership agreement between ZLC-MIT and Accenture, which aims to train managers and executives in business strategy with focus on value chain transformation in a digitized network.

In order to be closer to the business world and its needs, ZLC has launched a corporate programme that offers companies three levels of collaboration in 2015. The choice depends on the needs envisioned by the company.

The areas and the degree of interactions are presented below in terms of the three levels of collaboration:

- Academic partner (Level 1) – Academic partners are those who sponsor thesis projects under the ZLOG international master’s programme. The benefits that Level 1 collaboration brings to these partners are: new insights and approaches to a real-life supply chain challenge in the company through the interaction with a student supervised by an expert thesis advisor (Master thesis); priority access to highly qualified and in-demand supply chain professionals (Student Recruitment); Research Fest access where students present their final thesis projects, covering a range of

9. ZLC’s Academic year report 2015-2016, p. 34.

topics focused on various supply chain aspects (Research Fest); priority access to ZLC open programs and 15% discount on both open and customized executive education programs (ZLC Executive Education); network expanding on the worldwide coverage and across all industries (MIT Global SCALE Network); access to all summits, symposia, workshops, conferences, seminars and roundtables organized by ZLC (Events); access to MIT Global SCALE Newsletter.

- Research partner (Level 2) – Research partners are those with whom ZLC establishes a relationship which essentially is based around the concept of research. In addition to all the benefits afforded to an Academic Partner, a Research Partner also includes: research project; information access about projects, publications, research learning and results on a topic concerned the partner. Also, engaging in research projects and knowing insights beyond the published results of research (Research Club); Global Supply Chain Research Forum access (Research Fest and the Research Panel Discussion); special discount of 30% for sponsoring a second master thesis.
- Corporate partner (Level 3) – this is the highest level of collaboration, which in addition to encompassing the other two levels, implies that the company funds a professorial chair. In addition to all the benefits afforded to an Academic Partner and a Research Partner, a Corporate Partner also includes: access to cutting edge research results from the work of an Endowed Chair Professor and also get the support in promoting innovative insights and practices to ensure front-runner status in the company; align research with both the business and supply chain strategy guided by the experience and knowledge of ZLC experts and with the aim of improving the efficiency in the company (Company Day); deliver joint white papers in specific research topics of common interest between ZLC and the company; get the chance of being an influencer on R&D supply chain priorities and topics (European and International Research Consortia); be a member of the advisor committee at ZLC and contribute to the successful

development of a research and educational institution. (Advisor Committee); live a mind-blowing experience for 1 year in Zaragoza, developing personal and professional career together with ZLC faculty and researchers Sabbatical stay (1 chair for 1 year at ZLC); join one of the masters programs taught at ZLC (1 student fee waiver); Sponsor the PhD summer academy, full tuition masters' scholarships, students' awards, events, white papers or corporate spaces at ZLC facilities among others (Sponsorship); join the industry-leading Executive Program "Supply Chain Management: Driving Strategic Advantage" taught by distinguished faculty at campus MIT in Boston, USA (1 complimentary seat per year); get the support of ZLC to assess the greatest supply chain talent.

4.2. Strategic cooperation agreements with industry

So far ZLC has two strategic cooperation agreements with industry. They are signed with Clariant and P&G. After extensive interactions between ZLC and the companies in 2015 these long-term alliances are formalized. With them the scope of collaboration is extended to include applied research in cutting-edge topics as well as talent assessment, support and development.

The agreement with Clariant (the first "Corporate Partner" of ZLC) is focused on two main areas: talent management and research. With regard to research, Clariant is funding a professorial chair to access pioneering results in "Supply chain oriented towards value creation" research.

Procter & Gamble (P&G) and ZLC signed a Master Collaboration Agreement. This alliance should enable the two organizations to strengthen their relationship with regard to research, education and assessment. With this Master Collaboration Agreements, P&G, ranked by Gartner as one of the two best companies in terms of supply-chain management, recognizes research centers as experts in a specific field and grants them priority status for the company's numerous collaborative projects. ZLC now joins Virginia Tech University in the United States, and Kühne Logistics University in Germany as a benchmark center in logistics for P&G.

Section 5: Main Challenges, Key Success and Enabling Factors

Due to strong support of the local and national government bodies, business and other partners (MIT, universities and funding organizations) ZLC operates in such an environment that allows integration of all three knowledge triangle groups – research, education and innovation. Additionally, the ZLC' location (situated in the PLAZA) enables the synergy between academia, industry and society.

Interconnecting education, research and innovation and support to knowledge triangle activities is strong emphasized in the governance of ZLC. The involvement of diverse institutions (the Government of Aragón, University of Zaragoza, MIT and the local saving bank Ibercaja) in the HEI's governance facilitates the alignment of research and educational activities with the needs of society and business which is at the base of knowledge triangle concept. Furthermore, the foundation has a centralized system of governance. Every organizational unit has the power and the corresponding responsibilities to control the performance of ZLC's activities and initiatives. For instance, ZLC has a dedicated unit for knowledge transfer (KTO), meaning that ZLC uses one channel for knowledge transfer activities, allowing more control of them. ZLC' diverse funding structure allows reducing its dependence and decreases risks for financial stability.

The narrow scope of ZLC's activities, i.e. in the field of SCM and logistics, is the key to achieving leadership in the field, ZLC succeed due to that it has a distinctive competence that sets it apart from competitors.

The collaboration between ZLC and MIT Center for Transportation and Logistics in developing the MIT-Zaragoza Logistics (ZLOG) program is one of the key enabling factors in accomplishing its mission, because it provides a unique educational model combining challenging coursework, cutting edge research, and industry interaction.

ZLC successful performs its role in bridging the gap between academia, industry and society because of taken initiatives that promote and facilitate knowledge transfer. These initiatives include: developing of formal incentive mechanism for industry participation in education and research (ZAP program and Corporate program); partner network extension (strategic partnerships with top universities in the world and

with other external stakeholders); strong focus on talent development and internationalisation of science and education.

The changing higher education environment in the world is one of the main challenges for ZLC. They can be addressed to the potential difficulties that can arise in attracting international students. On the one hand, the intense competition in the international education market, offering lower cost study programmes taught in English, would decrease the inflow of students. On the other hand, although the competition in the education marketplace predominately depends on the quality of education, MIT SCALE Network extension, adding 4 more centers that offer similar programs modeled on MIT SCM program would cause an outflow of students from these countries and redirect others to them, taking into account the principle of proximity.

Section 6: Future Developments and Transferability

In 2016 ACPUA¹⁰ and ZLC have met. During this meeting information about the mission and performance of both entities is exchanged and the course of action from ACPUA towards ZLC is examined. So it is supposed that in the near future the next step will be in this direction.

The educational approach of ZLC, offering programs modeled on MIT SCM program, appears that is transferable and adaptable internationally. The ZLC approach inspired the MIT SCALE extension. The MIT Global SCALE Network, now operating in 4 continents, was initially formed in 2003 with the opening of the Zaragoza Logistics Center (ZLC) in Zaragoza, Spain. It expanded with the opening of the Center for Latin American Logistics Innovation (CLI) in Bogotá, Colombia in 2008, the creation of the Malaysia Institute for Supply Chain Innovation (MISI) in Shah Alam, Malaysia in 2011, and the recent openings of the Luxembourg Centre for Logistics in Luxembourg in 2015 and the Ningbo Supply Chain Innovation Institute China in Ningbo, China in 2016.

10. ACPUA is the the official agency for the evaluation of higher education in the region of Aragon ACPUA. It is a full member, together with ANECA and the rest of Spanish agencies, of the Spanish Network of University Quality Agencies (REACU). ACPUA is full member of ENQA (European Association for Quality Assurance in Higher Education).

Section 7: Lessons Learnt and Recommendations

The case highlights several approaches that fostering successful integration of the three dimensions of the knowledge triangle. They are:

- Maintaining strong links with local and national government bodies, business, HEIs and with other external stakeholders both locally and abroad.
- Applying more experimental approach to education
- Creating multicultural environment (e.g. initiatives for internationalizing science and education)
- Attracting business through flexible and beneficial agreements
- Developing of formal incentive mechanism for industry participation in education and research

Section 8: Contacts and References

Contacts

Dr. María Jesús Sáenz – Director of the Zaragoza Logistics Center

Tel: +34 976 077 600 Fax: +34 976 077 601

Email: info@zlc.edu.es

Address: Zaragoza Logistics Center (ZLC), C/ Bari 55, Edificio Náyade 5 (PLAZA) 50197, Zaragoza, Spain

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5.2. Rotterdam School of Management, Erasmus University, the NETHERLANDS

Section 1: Introduction

1.1. National and Regional Framework/Context

The Dutch logistics sector provides increasing added value to the GDP of € 62 billion (9,4%) and contributes towards employment with around 671000 people employed in the sector in 2014¹¹. According to the Logistics Performance Index (LPI) the Netherlands is one of the best performing countries, ranked 4th with an LPI score of 4.19¹². Internationally renowned as the “gateway to Europe” the Netherlands is at the forefront of innovation in logistics. This is because the knowledge has been put at the heart of the Dutch government strategy and of the rest stakeholders’ efforts towards creating and disseminating innovation in logistics.

The Dutch government, recognizing that logistics plays vital economic role and is one of the key factors for the international competitiveness of the Netherlands, gives top priority to the sector. In 2011 it identified nine “top sectors”¹³ and logistics is at the center of the government’s industrial policy. The triple helix Top Consortia for Knowledge and Innovation (Topconsortium voor Kennis en Innovatie – TKIs) have been established in which the government, industry and academia in these sectors work together to draw up research and innovation roadmaps and to implement research projects to realize the Top Sector ambitions. The TKI Logistics¹⁴ has been set up to boost innovation in the

11. Data are for the period Statistics Netherlands (CBS) - www.cbs.nl.

12. Worldbank, Logistics Performance Index, 2016 - <http://www.worldbank.org/>.

13. www.government.nl.

14. Since 2013, Dinalog (Dutch Institute for Advanced Logistics, launched in 2009 as part of the Governmental Strategic Platform Logistics initiative), NWO (The Netherlands Organisation for Scientific Research) and TNO (the Netherlands Organisation for applied scientific research) have worked together as TKI to realise private-public cooperation in logistics research. This concerns both innovation by means of fundamental and applied research and the valorization and dissemination of knowledge, experiences and results as well. TKI activities are focused on setting out a number of roadmaps for boosting logistics innovation and on internationalization of Dutch innovation in logistics. The last is done

Top Sector Logistics, drawing six innovation roadmaps for meeting its goals: Neutral Logistics Information Platform (NLIP – developing an open ICT infrastructure for the logistics sector); Synchromodality (facilitating integrated multimodal transport); Trade facilitation (reducing supervisory burden in logistics chains); Cross Chain Control Centers (4C – facilitating the consolidation of cargo); Service Logistics (improving logistics related to services); Supply Chain Finance (SCF – integrating knowledge of finance in supply chains).

In order to make research more relevant and attuned to the national agendas Erasmus University Rotterdam (EUR), being at the forefront in the field of Logistics and SCM research and education, has aligned its initiatives with the top-sector policy for logistics. In 2015, the following top sector subsidies were awarded: INDEEP – Logistics Innovation Management; 2 Truck Platooning (TNO); Effective Use of Reefer Containers for conditioned products through the Port of Rotterdam; a transition oriented approach (EURECA)¹⁵. Besides this, a number of EUR's scientists are involved in TKI Logistics governance.

Apart from the top sectors policy of the Dutch government, fostering of knowledge transfer is also reflected in other national initiatives. For instance, the knowledge valorization is set out as one of the objectives in the signed agreement between the VSNU¹⁶ and the Department for Education, Culture and Science in 2011¹⁷. One of the EUR's initiatives for making academic knowledge suitable for economic and social application, was the creation of the Erasmus Centre for Valorisation (ECV) in 2014. An example of knowledge transfer in the field of logistics and supply chain management is the Smartport – a joint venture between

through the Platform for Foreign Promotion, the European ETP-logistics ALICE, Living Lab Logistics Indonesia and other types of international cooperation.

15. EUR's Annual report 2015.

16. The VSNU is an Association of the fourteen Dutch research Universities, in which EUR is member.

17. General Agreement between the Ministry of Education, Culture and Science and the VSNU, December 9, 2011.

the Port of Rotterdam, Deltalinqs¹⁸, the municipality of Rotterdam, and various faculties at the Erasmus University Rotterdam and Delft University of Technology. In SmartPort all the stakeholders work to tackle future challenges by joining its efforts in creation, dissemination, and application of port related knowledge.

1.2. University Establishment

Erasmus University Rotterdam is a public internationally oriented research university. The EUR has been a legal entity governed by public law and established by law since 1 February 1973. However, EUR's history began sixty years earlier – 1913, the year in which the Netherlands School of Commerce (Nederlandsche Handels-Hoogeschool, NHH) was founded through private initiative with broad support from the Rotterdam business community. Through its more than 100 years of existence, EUR has a rich academic history – three winners of the Nobel Prize in Economics have been associated with the Erasmus University Rotterdam: Jan Tinbergen (1969), Tjalling Koopmans (1975) and Sir Clive Granger (2003).

Currently, the EUR is one of the biggest universities in the Netherlands with a student population of 23 362. It employs a total of 4 405 full-time equivalents, of which 56% are academic staff members, 37% management and support staff and 7% staff affiliated companies. The EUR has concentrated its education and research in four broad areas of expertise: Health; Wealth; Governance and Culture. The “Wealth” area is related to research and education in economics and management, including logistics and SCM. The four areas of expertise are linked to the seven faculties of the EUR. The research grouped in the four areas is conducted at research schools, research institutes, research centers or in research groups belonging to the seven faculties.

In line with the tradition in maritime research that was initiated at the EUR in the 1930's by Jan Tinbergen and his student Tjalling

18. An organisation that represents the interests of logistics and industrial companies in Rotterdam's port and the industrial area.

Koopmans, both Nobel laureates in 1969 and 1975 respectively, the University carries out research and provides education in the field of logistics and supply chain management. Two of EUR's faculties provide education and carry out research in the field – Erasmus School of Economics (ESE) and the Rotterdam School of Management (RSM), Erasmus University. Apart from that, two inter-faculty units are created for education and research in the field, which are part of both the above mentioned schools – The Erasmus Center for Maritime Economics and Logistics (MEL) and Erasmus Research Institute of Management (ERIM). The EUR also provides education and carries out research in the area collaboratively with five other Dutch universities in the Research School for Transport, Infrastructure and Logistics (TRAIL). Additionally, the Erasmus Centre for Urban, Port and Transport Economics (RHV) BV and the Erasmus SmartPort Rotterdam BV place logistics and related domains at the heart of its activities.

1.3. Organizational structure and Governance

The EUR has a complex organizational structure (Fig. 2). It is composed of:

- structures that are responsible for the administration and the management at the University level (Supervisory Board, Executive Board, Doctorate Board, University Council and Joint Committee);
- structures that are responsible for the administration and the management at the Faculty level (Faculty council, Faculty Board General, Faculty Board – Dean, Faculty Office, Academic units and Programme Board and Research Director);
- and various university's departments that support the university's activities (Marketing and Communications, Corporate Planning and Control, Education, Research and Student Affairs, Human Resources and Finance, Information and Communication Technology and Erasmus Facility Centre).

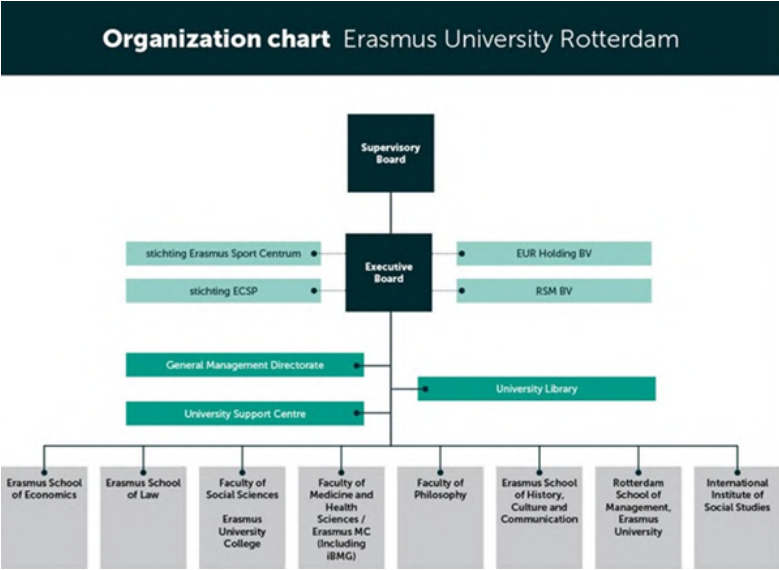


FIG. 2 - ORGANIZATIONAL STRUCTURE OF EUR, SOURCE: WWW.EUR.NL

The EUR has 7 faculties and 3 institutes. The management structure of the faculties has slight differences. It appears that not all EUR’s faculties have advisory board including industry experts. Their inclusion will help to better bridge the theory-practice gap that is unique in the present educational landscape. It is important to note that the advisory Board of one of the units that provide education in the field of logistics and supply chain management (RSM) is comprised of distinguished leaders from business and the public sector (City of Rotterdam, KPMG Netherlands, Shell International Exploration and Production, Heineken, TNT Express, Siemens Nederland, Port of Rotterdam Authority and others). The goal of their inclusion is to connect RSM with issues and practices of management in both public and private sectors. They advise the school on three levels: ensuring that its educational programmes serve the needs of business; ensuring that its research adds value to business practices; guaranteeing that RSM benefits its corporate partners, students and alumni.

This provides an on-going pipeline of ideas, knowledge and advice that serves to shape RSM's strategic agendas.

Part of the Erasmus University Rotterdam is the Erasmus University Rotterdam Holding BV (EUR Holding). It has its own structure and rules of conduct. EUR Holding was founded in 1995 and currently comprises 20 subsidiaries. The subsidiaries are active in the field of contract education, contract research and/or knowledge-exploitation and perform (provide) service-activities for EUR. The EUR is 100% shareholder of EUR Holding and EUR Holding is 100% shareholder of its subsidiaries. The activities of two of the subsidiaries are related to logistics and supply chain management – the Erasmus Centre for Urban, Port and Transport Economics (RHV) BV and the Erasmus SmartPort Rotterdam BV.

The EUR has a diverse funding structure. It derives income from educational activities (tuition fees and contract education), from government grants and subsidies, from public and private research projects and from other sources. In 2015 EUR's income amounted to € 554,1 (in millions). Nearly 47% of it is derived from Central Government Grant, while the remaining is from: work for third parties (32%); tuition fees (9%); and other sources (12%). The turnover has risen by almost 3% in comparison to 2014. This increase is mainly due to received Central Government grants¹⁹ (Fig. 3).

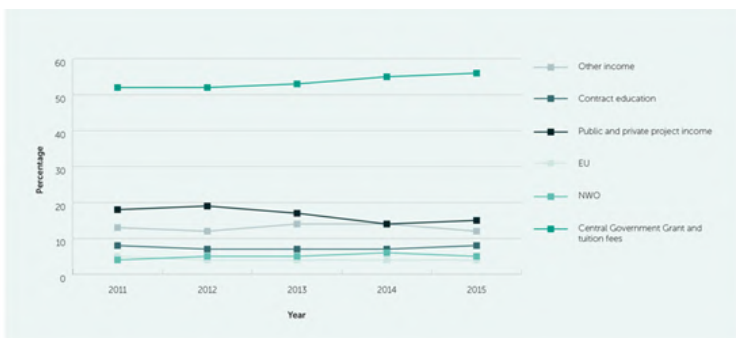


FIG. 3 - EUR'S INCOME 2015 IN €MILLIONS, SOURCE: EUR'S ANNUAL REPORT 2015

19. EUR's Annual report 2015.

In order to reduce dependence on the primary income flow the EUR has planned to derive more income through EU funding, contract education and research and more efficient business operations²⁰. Thus in addition to the potential of decreasing risks for financial stability, EUR by the proposed restructuring in income, especially in the face of contract education and through the participation in research projects, funded by EU or by other third parties, will foster cooperation and the creation of strategic alliances with external partners and international networks, allowing it to activate not only the interdisciplinary research, but also the knowledge transfer.

1.4. University research and education

Erasmus University Rotterdam is a highly ranked international research university. It has achieved remarkable national and international reputation for academic excellence, which is reflected in its position in the universities rankings. In 2016 the EUR has been ranked by the world's most influential university ranking (The Times Higher Education World University Rankings powered by Thomson Reuters) #4 in the Netherlands, #21 in Europe and #69 in the world.

In terms of education in logistics and supply chain management the EUR focuses mainly on postgraduate education. However, some elements of logistics and SCM have been included in all bachelor programmes and in several master programmes of RSM and ESE. The table below presents only the postgraduates programs in detail and their distribution by EUR's units:

EUR's unit	Type	Duration	Programme
RSM	Post-graduate	1 year full-time	Master of Science (MSc) in Supply Chain Management
	Executive Education	2 ½ years part-time	Executive Master in Customs and Supply Chain Compliance
	Executive Education	9 days	Diploma Programme in Customs and Supply Chain Compliance

20. EUR's strategic plan 2014-2018.

ESE	Post-graduate	1 year full-time	Master of Science (MSc) in Econometrics and Management Science with specialization in Operations Research and Quantitative Logistics
MEL	Post-graduate/ post-experience master programme	1 year full-time	Master of Science in Maritime Economics and Logistics (MSc)
		2 years part-time	
	Customized Courses	according to company needs	Wide-ranging spectrum of courses
	Customized Courses	2 years part-time	Maersk Liner Graduate Programme (MLGP)
ERIM	Post-graduate	2 years full-time	Research Master with specialization in Business Processes, Logistics & Information Systems
ERIM	Post-graduate	5 years full-time	PhD in Management in the field of Business Processes, Logistics & Information Systems
ERIM	Post-graduate	4 to 5 years part-time	PhD in Management in the field of Business Processes, Logistics & Information Systems
TRAIL	Post-graduate	4 years full-time	TRAIL PhD

TABLE 2 - EDUCATIONAL PROGRAMS PROVIDED BY EUR'S UNITS BY 2017

It is important to note that one of the EUR's units (MEL) provides customized in-house education to management trainees and staff of major maritime organizations such as Maersk Line, allowing companies to tailor-make a curriculum according to their own interests and priorities.

The research, as was mentioned earlier, is conducted at research schools, research institutes, research centers or in research groups belonging to the university's faculties.

Erasmus University Rotterdam has 20 research schools that have been accredited by the Accreditation Committee (ECOS) of the Royal Netherlands Academy of Arts and Sciences (KNAW). Two of them are

directly linked to logistics and SCM – Erasmus Research Institute of Management (ERIM) and Research School for Transport, Infrastructure and Logistics (TRAIL).

TRAIL is a collaborative initiative of six Dutch universities, EUR among them. It is accredited as research school since 1997 in the fields of mobility, transport, logistics, traffic, infrastructure and transport systems. TRAIL provides education at PhD level, initiates and conducts scientific and applied scientific research, engages in the transfer and exchange of knowledge such as collaborative initiatives that aim to connect scientific research and its applications in practice.

ERIM is an interfaculty research school of Erasmus University Rotterdam (EUR), founded in 1998 by two schools of EUR – RSM and ESE, with over 350 researchers. The research activities are organized into 5 research programmes. It is the ERIM Business Processes, Logistics & Information Systems (LIS) program which focus on innovation and optimization in the areas of logistics and supply chain management, including business operations and next generation information systems.

In 2016 ERIM's LIS research community consists of 94 researchers (34 tenured; 42 PhD candidates and 18 non-tenured). The presented data below in terms of research appointment (non-tenured/tenured/PhD candidates) shows that the number of researchers increases significantly (Fig. 4). While there is no change in the average number of tenure-track researchers, the number of PhD candidates increases. Moreover, the number of international students has grown in the past few years²¹. The attraction of international students creates such an environment that offers various benefits: expanding international connections; enhancing knowledge through its recombination; using the advantages which can be derived from various cultures and nationalities etc.

21. ERIM's Interactive performance statistics provided through business intelligence software by Dialogic.

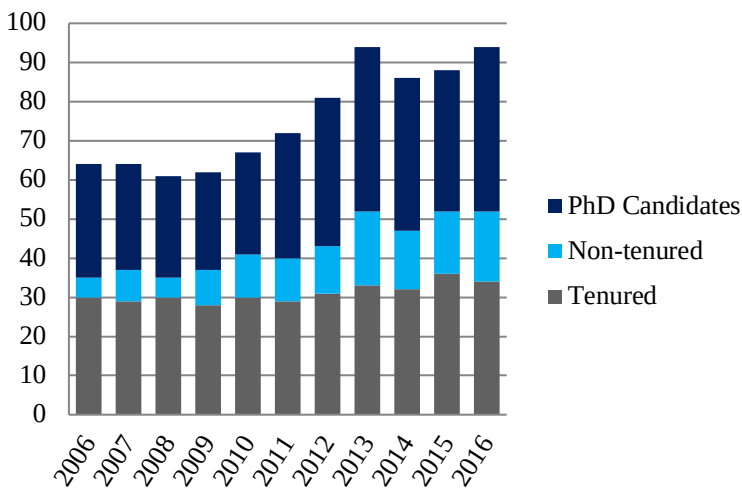


FIG. 4 - LIS PEOPLE PER RESEARCH APPOINTMENT,
SOURCE: ERIM'S INTERACTIVE PERFORMANCE STATISTICS

The LIS researchers strive for academic excellence and impact by targeting their publications towards the best journals and books in management research. Since 2000 more than 835 publications are produced. In 2016, total of 74 publications were found, all except 3 of them appear in the listed ISI Web of Knowledge Journal Citation Reports (JCR) (Thomson Reuters).

LIS research programme is organized into three research groups: Logistics and Supply Chain Optimization (LSCO); Operations and Innovation Management (OIM); Next Generation Information Systems (NGIS). Each of them is organized into several fields and has established research centers, attracting external funding and build bridges between academia, society and business (Table 3).

LIS programme	Fields	Centers and research groups
LSCO	- sustainability and supply chain optimization, including service logistics; - terminal optimization; - transportation management;	- Material Handling Forum - Erasmus Smart Port Rotterdam - Erasmus Centre for Optimization in Public Transport - Closed Loop Supply Chains (CLSC) Centre - Last-Mile Logistics Research Group
OIM	- operations and innovation management in supply chains; - product and service innovation; - purchasing and sourcing; - manufacturing; - outsourcing; - distribution; - behavioural operations management; - intra-organisational collaboration;	- Purchasing & Supply Management Centre - Erasmus Centre for Behavioural Operations Management - The Erasmus Center for Innovation Management (ECIM)
NGIS	- the impact of Next Generation Information Systems to the supply chains and the performance of firms	- Erasmus Centre for Future Energy Business - Erasmus @ Work - Erasmus Centre for Business Intelligence - Erasmus Centre for Data Science and Business Analytics - Learning Agents Research Group

TABLE 3 - FIELDS OF RESEARCH, CENTERS AND RESEARCH GROUPS OF LIS PROGRAMME

The research of each of the research groups and centers has resulted in many valuable insights into the logistics and supply chain optimization and developments for industry use. For instance, one of the

research groups has developed algorithms for picker routing that are integrated into standard warehouse management software packages and had designed principles for layout and system selection, which are used by numerous warehouse design companies.

Furthermore ERIM LIS has executed a great number of projects with private and public sector in different areas in logistics and supply chain management. Some of them are as follows:

- Shared European Logistics Intelligent Information Space (SELIS) funded under the Horizon 2020, aiming at delivering a “platform for pan-European logistics applications” – Erasmus University leads the work package on Business Model Innovations, and the Living Lab in port of Rotterdam with industry partners Port of Rotterdam, APM Terminals, Maersk Line, and Wayz;
- ISOLA project, funded by the Netherlands Organization for Scientific Research, aiming to support the development of the multimodal transport system in the Netherlands, and by extension in Europe, into a truly synchromodal transport system, in which infrastructure use, transport services and operations are perfectly aligned with market demand;
- Green and Effective Operations at Terminals and in Ports (Green EFFORTS) is a collaborative research project, co-funded by the European Commissions under the Seventh Framework Program, aiming at the reduction of energy consumption and improving a clear energy mix in the seaports and at terminals;
- Boxreload is sponsored by the Dutch Ministry of Infrastructure & the Environment, UK Department of Transport and funded by European Union’s Trans-European Transport Network (TEN-T) programme. Boxreload has been developed by the PARIS Optimal Transport Planning division of Hutchison Ports with the support of Erasmus University of Rotterdam. By combining the research skills of Erasmus with the transport planning and optimization experience of the PARIS division, Boxreload has the potential to realize significant economic and environmental savings in container transport.

- CO2REOPT – The project aims at optimizing transport supply chains by developing decision support systems for the co-ordination and synchronization of transports from a supply chain perspective. The consortium includes industrial and academic partners from Sweden (SICS, LKAB and TRV), Norway (SINTEF and JBV) and the Netherlands (EUR, SAMSKIP and SmartPort).

LIS research community not only collaborates with industry, but also plays an integral part in setting national and international research agendas. Besides this, the research groups are involved in sustainability-oriented research and education. The LIS members incorporate elements of sustainability both in their research and/or teaching: green supply chain management; sustainable logistics; closed loop supply chain management, reverse logistics; sustainable operations and risk and security management in global supply chains; co-ordination for sustainable global supply chains, synchromodal transport networks (a flexible and integral deployment of different modes of transport on a network to better meet customer demand and sustainability objectives) etc. Some of the research on developing analytical approaches to improve the economic and environmental performance of supply chains is organized through ERIM's Closed Loop Supply Chain centre.

All this supports the conclusion that LIS has high social and market impact, demonstrating that the EUR' focus is not only on commercialization of research but also on social and environmental sustainability.

Section 2: Parties involved in the Knowledge Triangle

Various parties are involved in the Knowledge Triangle – EUR and its various units, the Dutch government and its structures, the Rotterdam city government, the port of Rotterdam and private sector, Leiden-Delft-Erasmus strategic alliance and other research institutes and universities, students and alumni.

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

Mission, Vision, Values

EUR has the following mission: “Internationally, nationally and regionally, we develop talent and produce knowledge at the academic level, for individuals, business and society”. The mission statement certifies that the EUR has placed strong emphasis on knowledge triangle not only locally, but also globally. This implies that EUR has recognized that the cooperation is needed to safeguard the scientific impact and social relevance of the knowledge it creates.

3.2. Specific Education Initiatives

New experimental approach to education

Through RSM's Case Development Centre (CDC)²² business and management experiences are turned into powerful learning tools thus the case-based management education is supported. Moreover, academics and students, applying their fresh thinking, knowledge and experience, provide solutions for companies' business challenges. The RSM's CDC has developed a full portfolio of teaching cases, which are developed by working closely with businesses, containing nearly 100 cases and grows each year by 15-20 new cases. Some of RSM teaching cases are developed on logistics and supply chain management²³.

Beyond the case development, the links between the three aspects are supported by the methods and methodology of education used in EUR's programmes in the field of logistics and supply chain management. For instance, the Master program in SCM and executive programmes links students to both research and practice, presenting the best and proven tools and tactics used by leading firms, in combination with the latest cutting-edge research. The balance between theory and practice is also assured by the involvement of business experts – guest

22. CDC is the only organisation in Europe specialising in case writing established in 2008.

23. CDC's Case Catalogue – www.rsm.nl.

lectures, seminars and company visits. In the past years many companies with different backgrounds were visited. These companies include port terminals, shipping companies, banks, warehouses, logistics centers and district parks (ECT; Glencore; Meyer Werft; Port of Amsterdam; Port of Antwerp; Port of Rotterdam; Royal Haskoning DHV; Stolt Tankers; Samsung; CTA; HPA; Hapag-Lloyd). In addition, the extensive EUR's corporate network enables students to seek employment opportunities in the most prestigious "blue chip" organizations and, in some cases, take advantage of their infrastructure and information systems while writing their thesis.

While these methods are widely applied, some of EUR's programmes in the field of logistics are distinguished from others. For instance, the extracurricular activities such as the Distinguished Lecture Series and the Alumni Lecture Series are among the major hallmarks of the MEL's Extracurricular Professional Development Programme. The Distinguished Lecture Series (DLS) comprises a series of open seminars, by prominent business executives and academics, on a MEL related subject. These lectures are designed to provoke conversations and new ideas, and provide the students with the opportunity to network with high level executives. Another initiative is the Alumni Lecture Series, consisting of a series of open lectures given by MEL Alumni who are active professionals. During the lectures MEL alumni share their experiences since graduation with the current MEL class, and provide the MEL class with the opportunity to learn about how MEL helped advance their career.

Development of a competency based approach to curriculum design

EUR places substantial emphasis on including the views, experience and requirements of the industry in the design, contents and development of the curriculum in the field of logistics. As was mentioned, one of the roles of Advisory board of RSM is to advise the school on ensuring that its educational programmes serve the needs of business. For instance, the executive Master and Diploma Programmes in Customs and Supply Chain Compliance, backed by industry and government, were developed through close co-operation between trade associations, the

Dutch Customs office and RSM, and provide participants with the latest knowledge and insights in customs duties, taxes, trade legislation and compliance.

Ensuring the quality and relevance of education, research and technology transfer activities through Quality Assurance

RSM was the first public school in Europe to receive the prestigious AACSB Accreditation (1998) and is fully accredited by AMBA (1996) and EQUIS (1998), as well as by the Accreditation Organization of the Netherlands and Flanders (NVAO) for all its degree programmes, and by the Royal Netherlands Academy for Arts and Sciences (KNAW) for its research and doctoral programmes.

Flexible PhD programmes

In 2015 four-to-five year part-time PhD programme in Management started at RSM. It has the academic rigour of a full-time PhD degree and targeted toward business professionals interested in further developing their academic skills. Pursuing a PhD in a field related to their current professions can produce new and practical knowledge, helping their business grows and innovates.

Internships

The RSM's extensive corporate network provides the students with the opportunity to taste working life, anywhere from the world's largest multinational companies to fast-growing start-ups. Thus they can apply the knowledge they gain from the programme to a real problem in an organization during their internship. It is important to note that many of the students acquire their first job after graduation from the contacts they make during their internship.

The internship for MSc Supply Chain Management programme is an optional element. However, the best performing (e.g. with the highest grades) and most highly motivated students may be invited to take part in the Supply Chain Management Honours programme. The Hon-

ours programme includes an extra company internship, or a research project, plus an extra elective course in addition to the regular one-year MSc Supply Chain Management programme. Students can choose to specialize in the Honours programme by taking either a practice-oriented track that includes becoming involved in industry and government through case studies (company-based research and an internship), or an academic track involving taking part in a research project conducted by a member of RSM faculty and organizing an academic seminar. At the end of their specialized track, students must deliver a position paper; this is a document that is equal in quality and content to a conference paper, and is in addition to their master thesis.

The programme is organized as follows. Honours students must complete the extra elements after completion of the regular one-year programme. At the beginning of second semester, the EUR's staff starts the matchmaking process to find the right student for each company based on what the company needs, and the interests and talents of the student. Students and companies get to know each other during visits, or through virtual meetings. Honours students' company projects can last up to four months between mid-August and mid-December, twice as long as projects in the regular MSc Supply Chain Management programme. The Honours students' research proposal is the starting point of the final thesis, and is finalized in April before embarking on the four-month project in August. Students have access to their academic supervisors at RSM throughout the process in order to produce the highest quality work. Students successfully completing the Honours programme will receive a certificate indicating the additional ECTS achieved, and a testimonial from the industrial or government organization where their research project took place.

In terms of employability the courses provided have high levels of graduate employment (on average nearly 64 % of undergraduate students go on to work and/or further study within three months of graduating; 23% – 4-6 months and 9% above 6 months)²⁴.

24. RSM's MSc Employment Report 2016.

Talent development

The Erasmus University Rotterdam strives to develop not only students' talents but also the talents of all of its employees. The career policy of the EUR supports this by creating the conditions that enable each employee to develop in the direction that best suits his or her ambitions: Performance & Development interviews; Career-development & Mobility policy; Tenure track; Development days; TOP Training.

The purpose of the EUR career-development and mobility policy is to stimulate the continuous development of its staff. The career-development and mobility policy is directed at supporting and administrative staff as well as academic staff. However, there is a difference in the way the policy is structured for the two categories. For academic staff, the focus is on professional development and advancement within the academic positions. For the support and administrative staff, the focus is more on the further development of skills and/or advancement through appointment to various positions within the EUR.

The EUR has tenure track policy for selecting top talent and preparing these people for an academic career. If the academic with a recent PhD conferral meets the objective criteria set in advance, after its standard appointment for a fixed period (a track), he or she is offered an appointment for an indefinite period (a tenure). A tenure track can be positioned in different ways depending on the strategy of the school or faculty.

The Collective Labour Agreement entitles staff to a minimum of two personal development days per year (proportional to staff's contracted hours). These days are intended to increase their sustainable employability. They can take up these days for a variety of activities that can contribute to their personal career development and employability, such as: Trainings and courses; Internships – within EUR or elsewhere; Conferences; Workshops and seminars and Volunteer work with a clear development component. The training courses and programmes are given at EUR in the Training and Development Platform (TOP). TOP also works together with TU Delft and Leid-

en University²⁵. Beyond other collaborative activities, since 2014 the three universities have set up their own training and development programme for all employees of the three universities offering greater choice of courses and increasing the mutual exchange among colleagues in other universities.

Internationalisation of science and education

One of the key themes of the new EUR strategic plan 2014-2018 is internationalisation. The plan sets a course aimed at further strengthening the university's international position. The university wishes to be a "truly international university". To achieve it a lot of initiatives were taken in the past years – internationalisation of the curriculum; partnerships in international, intercultural teams and networks, establishing more connections with highly ranked universities, creating additional value for student exchange, joint education and joint research.

It is apparent that EUR already has a good international profile both in science and education in the field of logistics and SCM. The researchers participate in numerous international networks and research partnerships and have received many international accolades. The following examples can be given to illustrate this. ERIM LIS members are involved in the REVLOG – an European Working Group on Reverse Logistics; members are part of International Material Handling Research Colloquium planning committee and the College-Industry Council of the Material Handling Industry; ERIM LIS has received many international accolades for its work including the prestigious Franz Edelman Award for Achievement in Operations Research and the Management Sciences.

In terms of education, students are encouraged to participate in international exchange programmes. The international exchange is an optional element of the programmes in the field of logistics and SCM.

25. For many years, Leiden University, TU Delft and Erasmus University Rotterdam have been collaborating in many fields of education, research and valorisation. Their partnership was extended and formalised through the Leiden-Delft-Erasmus strategic alliance in 2012.

At present, more than 100 business schools and universities all over the world are participating in RSM's partner network. Most of these schools are members of either the Partnership in International Management (PIM), and/or CEMS, the global alliance in management education, of which RSM is the only Dutch member. Students who are not going on an exchange can participate in an International Business Project. This gives them the opportunity to study and work with RSM's international exchange students for one semester while doing their master courses at the same time.

3.3. Strategies and Support Systems for the Knowledge Triangle

Dedicated governance initiatives

The knowledge transfer is the main focus in university's strategy. The last strategic plan "Impact and Relevance"²⁶ of EUR has placed a strong emphasis on knowledge triangle activities. In recent years, some actions have taken place to achieve the priorities set out in the plan such as establishing the Erasmus Centre for Valorisation (ECV) in 2014 (mentioned above). In order to use the potential of knowledge transfer more effectively in the future, EUR has planned to take some crucial steps, among them selection of number of knowledge transfer indicators for measure success.

Support system for collaboration with external partners

The support systems and resources that assist collaboration with external partners are different – EUR Holding BV, ERIM LIS centers, RSM's magazines etc.

The established Holding BV is important for economic valorisation. The activities of the holding companies vary from education and research to advice and service provision. Currently, EUR Holding BV has twenty operating companies, within them the Erasmus Centre for Urban, Port and Transport Economics (RHV) BV and Erasmus SmartPort Rotterdam BV are the companies operating in the field of logistics.

26. EUR's Strategic Plan 2014-2018.

The collaboration is also facilitated through ERIM LIS centers of expertise, which working directly with organizations to address the challenges that business faces.

The exchanges between the business, academia and society have been facilitated by the RSM's magazines – RSM Outlook and RSM Discovery, acting as a bridge between management research and business practice. RSM Outlook distributed twice a year profiles the latest achievements of RSM alumni around the world, highlights recent findings from RSM research, and keeps alumni and business professionals up-to-date with the latest developments at the school. Through RSM Discovery, an on-line research platform, combining challenging articles with videos and interviews, business has easy access to the useful, cutting-edge business research by RSM faculty members.

Dedicated university offices for cooperation with external partners

The university including RSM and ESE has various departments that assist companies who seek for collaborations.

The companies, seeking an intern or a student for a final project position or having a suggestion for the subject of a Bachelor's and/or Master's thesis, could be assisted by departments, organized by faculty and programme – Career Services for RSM, Erasmus Business Center (Erasmus School of Economics) etc.

There are also a number of EUR umbrella organizations that have a broader task in relation to internships and final projects such as Integrand (the largest academic internship mediator in the Netherlands that links the corporate world in the Netherlands with students through final project internships, work-accompaniment internships, summer internships, work assignments and business courses) and AIESEC (non-governmental not-for-profit organization in the Netherlands that links the corporate world in the Netherlands with students through traineeship programmes, ambassador programmes and out-going preparation programmes).

Alumni Relations Team – Alumni are essential resources for every HEI, making a substantial contribution to the education as sharing their knowledge and experience and giving access to data for research. Thus EUR has a dedicated office for support alumni in areas such as lifelong

learning, professional development and social connections. Beyond this, alumni are attracted to contribute to the education, acting as mentors, guest lecturers, panel members in student competitions, interviewers for prospective candidates, or counseling for issues related to career choice and development. In this regard in 2015 RSM launched an online platform “MentorMe” that facilitates connections between students and alumni with regards to career advice and one-on-one mentoring.

Section 4: Collaboration with External Partners

To achieve its strategic ambitions EUR collaborates with institutional and corporate partners at local, national and international level, recognizing that the cooperation is needed to safeguard the scientific impact and social relevance of the knowledge it creates. EUR’s collaborations range from the exchange of information to strategic alliances.

EUR’s units which provide education and carry out research in the field of logistics collaborate with various academic institutions on research projects in a wide range of logistics areas and on education. Beyond this, RSM has developed close partnerships with companies with the joint aim of creating and acquiring new talents and enhanced knowledge within the fields of research and education.

4.1. Extensive university-research-industry partnerships

Collaboration in the field of education

Although the desire for partnering with EUR has predominantly driven by scientific research before, in recent years a lot of contacts have been made in other areas such as education.

For instance, EUR with other two universities (Delft University of Technology and Eindhoven University of Technology), the Customs Administration of the Netherlands and international associations representing international trade and supply chain partners contributed to the development of the Executive Master in Customs and Supply Chain Compliance programme. In this regard, the Dutch Government initiated the Top Sector Logistics Scholarship, which is available for people who are accepted to RSM’s Executive Master in Customs and Supply Chain

Compliance programme. Other example for collaboration in EUR educational programmes is the master MEL programme, which is founded and exists in cooperation with ten companies. Furthermore, a customized in-house course was developed by MEL and RHV for a group of 42 Maersk Liner “high potential” employees, part of the Maersk Liner Graduate Programme (MLGP). The MEL Corporate Network comprises more than 50 ‘blue chip’ multinational companies and organizations. They provide peer advice on future MEL direction, interact with MEL students through lectures, social events, and recruit among MEL students. Most notable among them are the Port of Rotterdam; Maersk Line; APM Terminals; BIMCO; Stolt Tankers; Vopak; DVB Bank; and Hutchison Port Holdings (ECT).

4.2. Strategic cooperation agreements with industry

Research collaboration

EUR researchers in the field of logistics and supply chain management engage in research collaboration under the aegis of ERIM LIS research centers and research groups. ERIM LIS centers and research groups have an extensive collaboration with the outside world – government organizations, private sector, partner universities etc.

One of the strategic partners of EUR is the Municipality of Rotterdam. The greatest demonstration of EUR’s cooperation with the municipality is the establishment of a brand alliance “Make it happen”: the municipality of Rotterdam, the Port of Rotterdam Authority, Erasmus University Rotterdam and Rotterdam Partners. One of topic areas in which they collaborate is SmartPort. In 2015, TU Delft, Erasmus University Rotterdam, the Port of Rotterdam, Deltalinqs and the City of Rotterdam signed an agreement to work together in SmartPort. SmartPort aims at making Rotterdam the ‘Smartest Port’ through knowledge development. It maps the parties and projects required to achieve specific targets/organizes knowledge alliances of businesses, researchers and authorities through 5 roadmaps, linked with the five challenges SmartPort has in focus: Smart Logistics; World Port City; Smartest Port; Future Proof Port Infrastructure; and Smart Energy.

The Leiden-Delft-Erasmus strategic alliance formalized in 2012 also collaborates with city and port. It aims to directly translate scientific results into innovations that can be used to benefit society and contribute to economic development. Under the flag of partnership, eight inter-university theme-based centers were therefore set up in 2013 to focus on complex social challenges. The activities of one of the centers are directly related to logistics and supply chain management – The Centre for Metropolis and Mainport. The main focus of the center is to develop, disseminate, and valorize knowledge on the connections between metropolises and mainports. The Centre is being built across four main themes for research:

- Sustainability which directions for research include sustainable supply chains, environment-friendly freight and passenger transport, sustainable port design and supportive government regulations;
- Synchromodality focuses on developing tools, techniques and methodologies that ensure efficient access of both persons and freight to metropolitan and mainports areas;
- World Port City which addresses the potential of the urban area to support the port function and the potential of the port to stimulate urban development;
- Secure international trade and global clusters focuses on mainports as hubs for the facilitation of global trade. Its research agenda aims to enhance the visibility of international supply chains in a multimodal fashion while protecting the environment and the society and promoting ethical trade.

The Centre for Metropolis and Mainport works closely together with the SmartPort initiative, especially related to the themes Synchromodality and World Port City.

Section 5: Main Challenges, Key Success and Enabling Factors

EUR has achieved excellence in research and education in various ways – close cooperation with industry, government and other institutions in education and research, establishment of EUR Holding BV, participation in LED alliance etc.

The establishment of EUR Holding BV is seen as an essential part of the knowledge triangle, especially the creation of the Erasmus Centre for Valorisation (ECV). Since its opening, the ECV strives to make knowledge transfer possible, operating as a hub for knowledge sharing and expertise exchange in the field of knowledge transfer. Successful knowledge transfer in the field of logistics and supply chain management is seen to be achieved through Smartport initiative.

It is important to be stress that knowledge integration in the field of logistics would have been impossible to achieve without the support of the government. The government has facilitated the establishment of innovative new partnership mechanism (TKI) through its policy and has provided the environment for knowledge triangle. Thus, EUR in the forefront in the field of Logistics and SCM research and education has aligned its initiatives with the top-sector policy for logistics, participating in various collaborative projects with this aim.

Moreover, the location of EUR is also a key to the excellence in research and education. The port of Rotterdam – one of the largest ports in the world, provides such a ‘living lab environment’ which enables opportunities for knowledge transfer. In this regards, the interactions between academia, society, business and government are facilitated through SmartPort initiative.

Section 6: Future Developments and Transferability

Recognizing the importance of evaluation and monitoring of knowledge transfer the new strategy put emphasis on the development of number of valorisation indicators to measure success. Another goal is to achieve a more balanced, future-proof revenue mix less dependent on primary funding. EUR has planned to reduce the dependence on the primary income flow by relative growth in the secondary and tertiary income flows, greater success in EU funding, and more income from contract education and research, which requires the links with other stakeholders be more fully activated. Thus knowledge transfer initiatives will be fostered.

Several features of the EUR approach could be replicated and applied in other HEIs. They are as follows:

- Establishment of a Centre for Valorisation dedicated to be a focal point for knowledge transfer activities;
- The model for experimental education could be transferred to other higher education institutions as a way to achieve balance between theory and practice;
- Development flexible research degree frameworks – thus more business professionals can be attracted to produce new and practical knowledge, helping their business grows and innovates.

Section 7: Lessons Learnt and Recommendations

- The case highlights several approaches that fostering successful integration of the dimensions of the knowledge triangle. They are:
- The used model of experimental education – Case Development Centre; involvement of business experts in education – guest lectures, seminars and company visits; The Distinguished Lecture Series; The Alumni Lecture Series etc.
- The involvement of distinguished leaders from business and the public sector in the HEI governance ensures that the educational programmes serve the needs of business; ensures that its research adds value to business practices; guarantees that HEI benefits its corporate partners, students and alumni.
- Strong institutional linkages with other Dutch universities – the participation of the university in Leiden-Delft-Erasmus strategic alliance, which help develop and disseminate knowledge in various business areas, including logistics.
- LIS has high social and market impact, demonstrating that the EUR' focus is not only on commercialization of research but also on social and environmental sustainability.
- Making research aligned with the top-sector policy for logistics.
- National environment, such as government policies drive the University to take different initiatives aimed at knowledge transfer.

Section 8: Contacts and References

Contacts

Kristel Baele – President of the Erasmus University Rotterdam

Tel: +31(0)10 4081751

Address: Erasmus University Rotterdam (EUR), Campus Woudestein, Burge-meester Oudlaan 50, 3062 PA Rotterdam, the Netherlands

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5.3. The University of Huddersfield, UK

Section 1: Introduction

1.1. University Establishment

The University of Huddersfield (“the University”) is a non-profit public higher education institution (public benefit entity) located in Huddersfield, West Yorkshire, England. Its history began in 1841 when five young men, employed by local industrialist Frederick Schwann, met with him, asking for support in establishing of a new subscription library and some elementary educational classes. Frederick Scwann helped them with establishing the classes in the room of the British School at Outvote Bank and found the subscription library. Since then the history of the university of Huddersfield has begun. The university has evolved and transformed over the years – from Mechanics’ Institute through Huddersfield Technical College, Huddersfield Polytechnic to University of Huddersfield.

Under the terms of the Education Reform Act 1988 the University was incorporated as a Higher Education Corporation (HEC). The Further and Higher Education Act 1992 (section 77) HECs who were Polytechnics to change their name to University and on 16 June 1992 Huddersfield Polytechnic becomes the University of Huddersfield.

1.2. Organizational structure and Governance

The University has extremely decentralized structure, governed through the University Council and the Senate with support from various committees, each with clearly defined functions and responsibilities, to oversee and manage its activities. The objects, powers and framework of governance are set out in the Instrument and Articles of Government.

The University Council is the principal decision-making body, responsible for the finance, property and staffing of the University. It is specifically required to determine the educational character and mission of the University and to set its general strategic direction.

The University Council consists of a Vice-Chancellor, External Members, Co-opted Members, Members Nominated by the Senate (Teaching Staff), Member Nominated by the Senate (General Staff), Student Member, Committee Members, and Clerk to the University Council.

The Senate has responsibility for the academic affairs of the University, concerned with issues related to the teaching and research work of the University. The Senate Committees are as follows:

- School Boards – local management committees.
- Research Committee – responsible for the strategic direction of research policy and for exercising oversight of the registration, supervision and examination of candidates for the University's research degree awards.
- Research Ethics and Integrity Committee – responsible for the development and implementation of policy and procedures to address issues related to research ethics and integrity.
- Teaching & Learning Committee – responsible for overseeing all matters related to the development and delivery of the programmes and ensuring the maintenance of the appropriate academic standards.

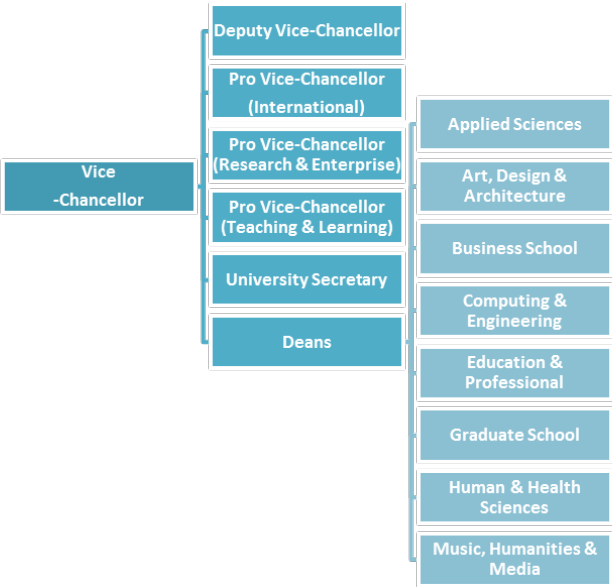


FIG. 5 - ORGANIZATIONAL STRUCTURE OF THE UNIVERSITY OF HUDDERSFIELD

The organizational structure of the University is presented on Fig. 5.

The University is organized into eight academic schools, each led by a Dean. As illustrated above the University has a broad disciplinary focus, which is an important driver of transition to an interdisciplinary approach in research and education. The schools themselves are organized into departments.

The University of Huddersfield’s Business School offers education in logistics and supply chain management area through one of its four departments – the Department of Logistics, Operations, Hospitality and Marketing. Therefore, this case study will focus on its knowledge triangle initiatives. They are presented in the sections below.

The Business School has an Advisory Board which has been established with the aim of strengthening links with industry and the professionals and providing input into the academic and strategic direction of the Business School. Leading experts, holding senior positions in busi-

ness, the public or voluntary sectors, and the professionals participate in the Board. The function of the Advisory Board is to provide an external perspective on the School's strategy and vision; support the School with its wider engagement regionally, nationally and internationally; to advise on new opportunities and the School's future development and to provide support in enhancing the reputation and profile of the School.

1.3. University research and education

The University is recognized as a leader in research and education in logistics and supply chain management. Its experience in the field has already spanned nearly four decades. In the early 1980s the education in the field began at Huddersfield with the degree established in transport and distribution. Thus, it is considered as the first UK's degree in the logistics field. The Business School's Department of Logistics, Operations, Hospitality and Marketing ("the Department") through two of its subject groups (Logistics, Supply Chain and Transport and Operations Management) offers a wide range of courses and programmes leading to officially recognized higher education degrees such as bachelor degrees, master degrees and doctorate degrees in this field of study.

The department delivers courses with full and part-time opportunities. The undergraduate courses are seven in total, two of them are top-up courses (1 year full-time) and the rest are 3 years full-time or 4 years incl. placement. All courses are accredited by the Chartered Institute of Logistics and Transport (CILT) or the Chartered Management Institute (CMI) excl. top-up degree courses. Two of them are conducted under the NOVUS scheme at the University, an innovative initiative, bringing industry and the university together to enhance the education and the development of Huddersfield students (more details for NOVUS scheme are presented in the sections below).

The Department offers two master's degrees (1 year full-time), all accredited by the Chartered Institute of Transport and Logistics (CILT) and the Chartered Institute of Procurement and Supply (CIPS). One of the programmes (Logistics and Supply Chain Management MSc) is primarily targeted at graduates who wish to move into

a logistics, operations or supply chain role but whose first degree is in another subject.

Graduates have the opportunity to make Master's or PhD thesis (full-time or part-time) in the area of the work of the department's research groups.

The Department has a dynamic research community across all four subject groups who are involved in interdisciplinary research and focuses on various topics within the respective subject areas. The Transport, Aviation Logistics and Supply Chain (TALoS) and the Business Operations, Systems Rail and Projects (BOSRaP) research groups are at the core of research activities related to Supply Chain Management, Transport, Logistics and Operations Management, at the Business School. The TALoS research group incorporates research in the areas of Transport, Aviation, Logistics and Supply Chain management using a multi-sector and interdisciplinary approach. The BOSRaP focuses on aspects of key research areas in the design and management of processes, products, services, strategic operations management, performance measurement systems, supply chain management, and project management.

The research groups generate income through research grants and enterprise activities, working with both the public and the private sector. The research groups maintain their research activity through various sources of funding – KTPs²⁷, national funding schemes (e.g. ESRC)²⁸, Horizon2020 and others. The groups' members publish extensively in internationally leading journals such as *International Journal of Operations and Production Management*, *Maritime Economics & Logistics*, *Supply Chain Management: An International Journal* etc.

27. Knowledge Transfer Partnerships (KTPs) are a national initiative, consisting of a three way partnership between an external partner (a business, some public sector organizations and charities) a graduate (known as the Associate) and an academic. KTP is funded by Innovate UK (the UK's innovation agency).

28. The Economic and Social Research Council (ESRC) is the UK's largest organisation for funding research on economic and social issues.

Section 2: Parties involved in the Knowledge Triangle

The University of Huddersfield through its Business School's Department of Logistics, Operations, Hospitality and Marketing, NOVUS Trust, the Government through its regulations and funding schemes, students and business.

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

Mission, Vision, Values

Throughout its 175 years of history, the University has strived to serve the society by developing and “inspiring tomorrow professionals”. The University’s vision is “To be an inspiring, innovative University of international renown”. Therefore, the University’s mission, as an articulation of the vision, is: to deliver an accessible and inspirational learning experience; to undertake pioneering research and professional practice; and to engage fully with employers and the community. This means that University’s strategy should be based around the three elements of the knowledge triangle – research, education and innovation. Furthermore, every University’s units should implement such practices that support the University’s view, having a strong professional orientation and focus on employability and linking theoretical knowledge with practice, creating knowledge valuable for businesses and society.

3.2. Specific Education Initiatives

New interdisciplinary and experimental approach to education

The university has a long-standing reputation as a student-centred university, providing practice-oriented education and focusing on employability. The Department strengthens its position, providing a hands-on approach to learning with opportunities available for students to experience real life logistics environment. This practice-orientated approach to education is manifested in numerous initiatives.

All the courses provided are taught through series of lectures, tutorials, seminars and workshops. In addition to those traditional tech-

niques, the department uses some innovative teaching methods such as case studies and projects, simulations and interactive games. For instance, the University of Huddersfield was the first in the UK that implemented the Fresh Connection (supply chain simulation game), widely seen in the business world as a powerful training tool, into its courses. The students also have the opportunity to experience industry specific software in the area of linear programming, planning, inventory control, forecasting and simulation in logistics (e.g. the students from the master's degree courses are introduced to the widely known SAP ERP information system).

Alongside this, the courses are packed with professional development opportunities through work experience, placements, mentoring, guest lectures, site visits, field trips and professional qualifications. This happens thanks to the fact that the Department has established a large number of industry contacts and links with professional bodies such as Chartered Management Institute (CMI), Chartered Institute of Logistics and Transport (CILT), Chartered Institute of Procurement and Supply (CIPS). Two of the courses provided (Logistics and Supply Chain Management BSc(Hons) and Business with Supply Chain Management BA(Hons)) are backed by industry partners in the NOVUS Trust, including a total of 30 companies from the retail sector (like ASOS, Sainsbury's and Morrisons), manufacturing (such as PZ Cussons, Cummins and Arla) and logistics (DHL, Wincanton, CEVA).

Under the Novus scheme students regularly visit company sites for project work and site tours. While the site tours enable students to learn how leading companies organize and manage the planning, sourcing, manufacturing and physical logistics of their supply chains to ensure business success, and to see the latest technology and the implemented ideas, the company sites visits for project work help developing their problem solving capabilities through the experience in application of logistics techniques and tools (one day problem solving workshops). Moreover, students also take part in field trips. For instance, students in the second year of their education travel to the Netherlands to visit major logistics facilities such as Rotterdam port and Schipol airport.

Additionally the NOVUS courses provide company mentoring throughout the programme. More than 100 industry people are involved in mentoring Huddersfield's students – they include senior directors and managers from many different businesses and industries. Their main commitment is to help young people reach their potential.

Thus, throughout the courses, provided by the Department, students have the opportunity to network with experts from industry and investigate real-business scenarios, enabling them to see the link between theory and the practice, deepen their knowledge and gain some experience.

All the students in their final year of both undergraduate and post-graduate studies are required to carry out own research on a particular problem in order to graduate.

Development of a competency based approach to curriculum design

The partnerships with industry help the department to shape the content of its courses. All the courses have an industry-focused content, especially those under the Novus scheme. Engaging the industry in the design of courses ensures that they fit with real business needs and give students exactly the skills they will need.

Ensuring the quality and relevance of education, research and technology transfer activities through Quality Assurance

The University has structures in place to ensure there is quality enhancement at an institutional level, driven through the University's Strategy Map and associated Teaching and Learning Strategy.

The University has adopted "Quality assurance procedures for taught courses and research awards". They have been developed and aligned with the UK Quality Code for Higher Education (the Quality Code), as published by the Quality Assurance Agency (QAA), to ensure that academic standards are set at a level which meets the UK threshold standard for the qualification concerned. The Quality Assurance Handbook describes the procedures for the validation and annual evaluation of courses, programmes of study and research awards, including those val-

idated by external bodies, and for the review of teaching, research and academic support services.

Flexible PhD programmes

The University has developed flexible research degree frameworks (MSc by Research and PhD), allowing researchers to choose studying on a part-time and full-time basis. These flexible models can attract individuals who are in industrial or commercial employment and who wish to undertake Research and Development on a part-time basis to solve problems or develop enhancements for their work purposes. Currently the University has a thriving research community made up of over 1,350 postgraduate research students from all over the world with around 43% from overseas and 57% from the UK.

Dual programme combining study and work experience

The University has a history of close involvement with business community. The extent of that involvement is well illustrated by the fact that the University is among the UK's top 10 providers of sandwich courses placements where its students undertake a 12 month paid work placement in industry or commerce. The main reason for this is due to the strong professional orientation and focus on employability that the University has.

Supporting the University's strategic focus on employability of students, the Department strives to guarantee the employment of its students through business partnerships development. It has created dual programmes combining study and work experience. Therefore, 100% of students have the opportunity to undertake professional work experience during their studies. Through these efforts students can develop new skills and gain a valuable experience, which will be advantageous to their future careers.

The Department provides its undergraduates with the opportunity to obtain a one-year (48 weeks) work placement in their third year of study. While the work placement is compulsory for two of the courses, this is optional for the rest. The courses that offer compulsory work

placement are those developed in partnership with the NOVUS Trust. Thus, the third year of the corresponding course is spent on salaried placement with one of the companies backing the NOVUS scheme (in the UK). There are a wide variety of opportunities with sponsor companies in many different sectors – manufacturing, retail and logistics services. Additionally to the sandwich courses there is also another option for work experience – summer work experience with a NOVUS company for a period of 8 to 12 weeks.

As a part of the NOVUS scheme, the students have the opportunity to gain additional professional qualifications, linked to the curriculum of their course. This could be in areas such as project management, quality improvement or road transport management.

Most importantly, however, the NOVUS scheme provides a guaranteed graduate job with one of the sponsoring companies (subject to meeting scheme criteria)²⁹. This will further contribute to talent development. Thus the employing companies, knowing that the student will be returning to work for them after completion of the programme, can additionally invest in his or her development and have a vested interest in ensuring student have a great placement experience.

In terms of employability the courses provided by the Department have exceptionally high levels of graduate employment (on average nearly 96 % of undergraduate students go on to work and/or further study within six months of graduating)³⁰. Previous students on these courses have enjoyed placements with companies such as Sainsbury's, DHL, Cummins, Marks & Spencer, Wincanton, ASOS and PZ Cussons. The positions held in these organizations range from Network Operations Support Manager, Supply Chain Analyst, e-fulfilment Solutions Graduate and Materials Improvement Specialist etc.

29. Graduation with a 2.1 degree and achieving satisfactory references from student's placement employer and his or her personal tutor at the University.

30. Destination of Leavers of Higher Education (DLHE) – 2014/15.

Internationalisation of science and education

The University of Huddersfield has a wide range of international partnerships and exchange agreements with academic institutions in China, India, Malaysia, Singapore etc. On the basis of these partnerships and exchange agreements the University welcomes teachers and students from its partner institutions across the world, offering priority entry to its undergraduate and postgraduate courses and the opportunity to work in one of its research groups. Furthermore, the University is a member of the Northern Consortium³¹. Comparing to some UK universities that starting to experience significant declines in international student numbers, the University continues to have growing international reputation. Almost a fifth of university's students are non-UK students according to the financial statements of the University of Huddersfield for the year ended 31 July 2016. However, here it is important to note that Brexit presents a potential risk for future attractiveness of the UK as an international student destination.

In addition to admission of international students at the University, internationalisation is promoted by enabling students to widen their cultural and academic experiences through studying in another country. The Erasmus scheme and exchange agreements are in fact such an option for students to study abroad for part of his or her degree. For instance, the students, studying in Supply Chain Management BSc (Hons) programme, have the opportunity to study abroad in the Netherlands or Finland.

3.3. Strategies and Support Systems for the Knowledge Triangle *Support system for collaboration with external partners*

Strong supporting system for collaboration with external partners is the Knowledge Transfer Partnerships (KTPs)³². They are a national initi-

31. The Northern Consortium is an educational consortium, established by a group of leading universities in the north of England, with the aim to facilitate access to British education for international students. Currently the Consortium consists 16 partner universities.

32. Knowledge Transfer Partnerships (KTPs) are funded by the UK's innovation agency (Innovate UK).

ative, consisting of a three-way partnership between an external partner (a business, some public sector organizations and charities) a graduate (known as the Associate) and an academic. The KTPs typically last from 18 months to 3 years and provide the following opportunities:

- The Academic (known as the Knowledge Supervisor) have the opportunity to: see his or her research being put into practice in a commercial arena; develop and publish papers; gain insights on what employers want from the university's graduates; develop further a long-term relationship with a company; help one of his or her recent graduates find an excellent job.
- The Associate gets: a fast track career managing a project central to a company's strategic development; a training and development programme, including leadership and management skills; a job for 2 years and – in 70% of cases – a permanent position with the business.
- The Company gets: latest knowledge and state of the art research from the University; commercial benefits of research and development; interview with a talented graduate (typically two year); a long term partnership with the University.

Dedicated university offices for cooperation with external partners

The Business School has a dedicated Placement Unit (BPU), aiming to primarily support first and second year undergraduate students to find placements in the area corresponding to their study. Every year, around 100 companies use the Placement Scheme at the University of Huddersfield Business School. Companies are not long term committed and they are supported by the unit throughout the placement process. Before placement BPU arranges company visits/talks, arrange interviews (on or off site). During Placement at least one tutor visit to the company to see student and supervisor. In order to assess the students' progress there are two appraisals.

The Service to Business office serves as a single point of contact into the University for all its external visitors supports companies from all industry sectors providing access to the extensive knowledge, skills and

resources at the University of Huddersfield. The unit assists in the following areas:

- **Creating Connections:** connecting companies with experienced researchers; establishing Knowledge Transfer Partnerships (KTPs); etc.
- **Inspiring Innovation:** the unit supports companies in identifying the appropriate funding for their business and informing and consulting companies about possibilities for innovation through the 3M Buckley Innovation Centre.
- **Developing People:** nurturing company team through continuing professional development courses – all accredited by the University of Huddersfield; developing strategic capability through masters' courses, enabling businesses to develop their strategic level knowledge and expertise; providing talent.
- **Providing Facilities** – access to state-of-the-art technology and to new methods of analysis.

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

Collaboration in the field of education

The Business School has a strong professional orientation. Each subject group works with various external organizations and has the appropriate professional links for enhancing learning on the courses, as well as conducting industry valued research. The Department of Logistics, Operations, Hospitality and Marketing collaborates closely with many industrial partners. The operations subject group has excellent links with both manufacturing and service industries, sports organizations and the NHS. The Logistics, Supply Chain and Transport subject group runs the only UK undergraduate degree in Logistics and Supply chain Management that is supported by 30 leading companies in the UK through the NOVUS Trust. They have excellent links with logistics providers, ports and airports, retailers, manufacturers and software providers.

In relation to logistics and supply chain management the Department has established close relations with nationally and globally rec-

ognized professional organizations such as Chartered Management Institute (CMI), Chartered Institute of Logistics and Transport (CILT), Chartered Institute of Procurement and Supply (CIPS).

Thanks to these contacts, students are able to listen to some great guest lectures, go on site visits and also have the chance to take work placements opportunities.

Due to the recognized shortage of skilled professionals in logistics and supply chain management NOVUS educational initiative has been launched in 2013. The NOVUS scheme aims to attract and develop talent in logistics and the supply chain (to create the “Leaders of Tomorrow”). It has been developed by BiS Henderson and the Chartered Institute of Logistics and Transport in sponsorship and collaboration with the Lloyd Fraser Group, Premier Foods, Unipart Logistics, the University of Huddersfield and Wincanton. Currently the Novus Trust consists a total of 30 companies from the retail sector (like ASOS, Sainsbury’s and Morrisons), manufacturing (such as PZ Cussons, Cummins and Arla) and logistics (DHL, Wincanton, CEVA). The NOVUS scheme is such an initiative that brings industry and the university together to enhance the education and the development of students.

Under the Novus scheme courses have been designed collaboratively by industry professionals and academic experts to give students all the skills, competencies, knowledge and experience needed to prepare them for a successful career in logistics and supply chain management. The courses are packed with professional development opportunities through work experience, placements, mentoring, guest lectures, site visits and professional qualifications.

The benefits that NOVUS scheme brings to students are: a guaranteed graduate-level supply chain and logistics job with one of NOVUS sponsoring companies on successful completion of the course after graduation (subject to meeting scheme criteria outlined above); a course designed in partnership with leading businesses; paid summer internships and third-year placements; industry-led seminars and site visits; a company mentor throughout the course; additional professional qualifications.

The benefits that NOVUS scheme brings to NOVUS sponsors are: ability to tailor the course content, fitting to business needs; reduced graduate

recruitment costs; longer term benefits in higher graduate retention levels; access to knowledge and expertise that can lead to innovations.

Novus scheme has been widely acknowledged through the years as an innovative platform for talents development. It has won three major awards – Retail Week ‘Supply Chain Innovation Project of the Year’ award, along with the CILT Annual Award for Excellence for the ‘Development of People’ in 2014. In 2015 Novus has won the European Supply Chain Excellence Awards for ‘Training and Professional Development’, sponsored by PricewaterhouseCoopers (PwC).

Section 5: Main Challenges, Key Success and Enabling Factors

The national support is critical driver for integration of the knowledge triangle activities. Initiatives such as KTP’s facilitate interconnecting education, research and innovation and benefit all the parties involved – business or public sector organizations and charities; a graduate and an academic.

National environment, such as the shortage of skilled professionals in logistics and supply chain management, drives the University to enhance the education and to develop talents. Thus, the university’s initiatives are focused on enabling both the long term viability and sustainability of business and improved competitiveness of young people.

Talent development is seen as a vital element of the integration of all three knowledge triangle groups – academia, business and society. In order to develop talents and enable them to compete more effectively in the real world, the Department has been partnering with a large number of companies and with nationally and globally recognized professional organizations towards developing a practice-oriented education in logistics and supply chain management.

Shared governance model, incorporating business in the HEI’s governance and in the academic affairs, strengthens links with industry and the professions, and provides input into the academic and strategic direction of the University.

The flexible models provided by the University through part-time MSc by Research and PhD programmes can attract more individuals who are in industrial or commercial employment to solve problems or

develop enhancements for their work purposes, thus strengthening the knowledge triangle.

The University has actively promoted international exchanges with business (e.g. field trips in the Netherlands) and HEIs abroad. The established partnerships and exchange agreements with institutions abroad as well as the international renown of the University contribute to the internationalisation of science and education. However, Brexit is unlikely to have a positive impact on the attractiveness of the UK as an international student destination.

Section 6: Future Developments and Transferability

Dual programmes combining study and work experience could be easily replicated if appropriate conditions are set. The transferability of this practice is best illustrated by the fact that the Novus's vision for the future of the initiative is the creation and establishment of a choice of four-year Supply Chain Honours degree courses, sponsored by NOVUS member companies and hosted by three leading UK universities.

Another good practice that can be transferred is the establishment of flexible PhD and other educational programmes by research.

Section 7: Lessons Learnt and Recommendations

The University of Huddersfield successfully performs its role in bridging the gap between academia, industry and society because it has taken initiatives that promote and facilitate knowledge transfer. These initiatives include: engaging the industry in the academic affairs (internships, placements, mentoring, guest lectures, site visits, field trips and professional qualifications); extensive university-research-industry partnerships (KTP's); strong focus on talent development (applying experimental approach to education) and internationalisation of science and education (promoting international exchanges).

The case highlights several approaches that foster successful integration of the three dimensions of the knowledge triangle. They are:

- Establishing closer links with industry, professional and HEIs both locally and abroad;

- Engaging the industry in the academic affairs. Thus it ensures that the education and research activities fit with real business needs;
- Shared commitment of the university and the business to enhance education;
- Focus on bridging the gap between theory and practice through applying experimental approach to education;
- Creating multicultural environment (e.g. initiatives for internationalizing science and education);
- Strengthening the knowledge triangle through flexible models for research and education.

Section 8: Contacts and References

Contacts

Professor Bob Cryan – Vice-Chancellor

Tel: +44 (0)845 155 6666 Fax: +44 1484 516151

Address: University of Huddersfield, Queensgate, Huddersfield, HD1 3DH, UK

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5.4. University of National and World Economy, BULGARIA

Section 1: Introduction

1.1. National and Regional Framework/Context

The University of National and World Economy (UNWE) is the largest and oldest school of economics in Bulgaria and Southeastern Europe, the leader in Bulgarian higher education boasting 97 years of history as an integral part of the European educational and research environment and a preferred destination for young people who want to receive contemporary education. The University is located in Sofia, the largest city

in Bulgaria's capital. The city is the 15th largest in the EU, with a population of over 1.3 million. Sofia is the major administrative, industrial, transport, cultural, research and education centre in the country. Around 50% of Bulgaria's GDP is realised in the capital. The Bulgarian Academy of Sciences is located here, with its 47 research institutes, as well as 22 out of 51 accredited higher education schools. Among them is the University of National and World Economy – the most renowned higher school of economics in Bulgaria and Southeastern Europe. According to the Ministry of Science and Education's electronic register, there are 21 432 students in UNWE studying in the regular or distance form of education in the bachelor's or master's degree and 410 doctoral students³³.

The vast network of science institutions, universities and enterprises in Sofia favours the advance of innovation cooperation between business, science and education. It creates opportunities for the commercial application of research results and facilitates the application of an integrated approach to education.

1.2. University Establishment

UNWE is the successor to the Free University of Political and Economic Science (Balkan Near eastern Institute), established in Sofia in 1920, later on the State High School of Financial and Administrative Science (1938), the Faculty of Economic and Social Science in the Sofia State University "St Clement of Ohrid" (1947) and the High Institute of Economics "Karl Marx" (1951), which was transformed into the University of National and World Economy by virtue of a decision of the National Assembly in 1995³⁴. The university is a coordinating unit for Bulgaria in the Central European initiative for inter-university relations and is in cooperation with more than 100 universities across Europe, Asia and America. In the long term the University aspires to extend the cooperation on master's degrees, research projects, distance form of education and student and teacher exchange.

33. Rectors' annual report for the period December 2015 - December 2016.

34. <http://www.unwe.bg/>.

Since its inception 97 years ago, University graduates have risen to be prominent scientists, statesmen, ministers, MPs, men of affairs.

1.3. Organizational structure and Governance

UNWE is a public higher education school. Its structure includes major units (faculties, institutes), branches, departments and servicing units. There are eight faculties in UNWE: General Economics, Finance, Management and Administration, Business, Economics of Infrastructure, International Economics and Politics, Applied Informatics and Statistics and Law; 33 departments; Postgraduate Qualification Institute (along with a Centre for continuing education and a Foreign language school), centre for remote form of education (with regional centres in Haskovo and Plovdiv); Intellectual property and leadership institute; Entrepreneurship development center; International centre for career development and others.

The governing bodies in UNWE include the General Assembly, the Academic Board and the Rector. In his activity the Rector is supported by vice-rectors, a Rector's board, Rectors-Deans board, Assistant Rector, Secretary General and others.

1.4. University research and education

Teaching and conducting research in the fields of economics, management and administration, law and politics, the University of National and World Economy sees itself as a future leader among higher schools in Southeast Europe. At the heart of UNWE's high competitiveness as an academic institution stands the successful innovation in various areas – education, research activity and management of university networks. Innovative practices shape UNWE's model for advancement and development. The objectives and tasks of UNWE's academic activity are adequate to community requirements.

UNWE's major functions include the following:

- Teaching to students, PhDs and post-graduates; continuing teaching of individuals with secondary or higher education
- Training of researchers
- Conducting research

One of UNWE's major goals is to carry out education that creates highly qualified and well-read specialists in accordance with its academic mission and in line with national and European academic standards. The latter provide the basis for a flexible mechanism for teaching bachelors and masters alike. It further opens up the opportunity to choose specialisation in a certain field, ensuring mobility across disciplines, mobility of students and building cooperation with other universities. In this regard teaching education in the bachelor's degree programs "is conducted in professional divisions, subdivisions and disciplines of higher education in order to ensure the wide profile of the preparation"³⁵. Some 500 regular teaching staff, of which 280 habilitated, take part in rendering academic education to more than 22 000 students in the various forms of education in UNWE.

The structure of the University's educational profile defines its areas of competence – economic science, law, management and administration, social sciences, media and mass communication. In these five professional fields one can find 54 different bachelor's degrees in both regular and distance form of education. The development of a wide variety of programmes creates conditions for adequate training and provides for the cross-disciplinary knowledge and skills required in the present day. In the first and second year of the bachelor degree programs students study general subjects, while in their third year of study – optional disciplines and in fourth – special disciplines. In all three stages of higher education – bachelor, master and PhD - students have the opportunity to choose optional subjects.

In the master's degree, the variety and dynamic renewal of disciplines is in line with the private and public sectors' demand. There are 37 PhD programs at offer. Education in UNWE is highly valued by business – according to recent NSSI data, around 97%, or practically all of UNWE graduates, are successful on the labour market³⁶.

Since 2004 a European Credit Transfer and Accumulation System (ECTS) has been in place, in compliance with Education Ministry's Ordinance №21.

35. Rules and regulations guiding education.

36. Rectors' annual report for the period December 2015 - December 2016.

The favorable organisational, material and financial conditions created for the faculty research provide for serious high-quality output that is mainly practice-oriented. In 2016, the university developed and adopted a strategic framework for research for the period 2016-2020. The strategy focuses on promoting faculty's commitment to research and applied consultancy. Research is accompanied by an ever growing number of science projects, as well as an increasing amount of funds attracted from national or foreign sources. UNWE has been a partner in a number of EU framework program projects and a member of the official record of research institutions in Europe since 2011. In 2016 110 research projects were completed and 25 conferences held, 14 of which with international participation³⁷.

The training and development of UNWE's academic staff are closely related to research. An important aspect of the academic community's contribution to industry and the state is the participation of UNWE professionals in management and expert boards, as well as in consulting various projects and business endeavours.

The number of PhD students that conduct research in various fields is on the rise. The first two graduates from the joint program between UNWE and the Free University of Brussels defended successfully their doctoral thesis in 2016 and received PhD from both institutions. As a result of the high quality of education, for the second time in 2012 the higher school was awarded the highest grade among all Bulgarian universities by the National Evaluation and Accreditation Agency (NAEA). UNWE is also accredited from the Institute of Chartered Accountants in England and Wales (ICAEW), which offers first level certificate exemption to students from the Finance and accounting faculty.

Section 2: Parties involved in the Knowledge Triangle

The parties integrated in the logistics knowledge triangle are:

- UNWE represented by its Department of Logistics, whose academic staff provides the training and research in the field of Logistics and Supply chain management;

37. Annual report session of the research and development unit 2016.

- Centre for Logistics Research at UNWE;
- Non-profit organisations such as Bulgarian chamber of commerce and industry, Bulgarian industrial association, Bulgarian logistics association, Bulgarian association for management, development and entrepreneurship, Association of the Bulgarian enterprises for international transport and roads, together with organisations that perform logistics functions such as manufacturing and commercial companies with well-developed logistics departments, logistics service providers and suppliers of logistics equipment and software. The Department of Logistics at UNWE is the only one in the country that offers logistics education at all three educational levels –bachelor, master and PhD.

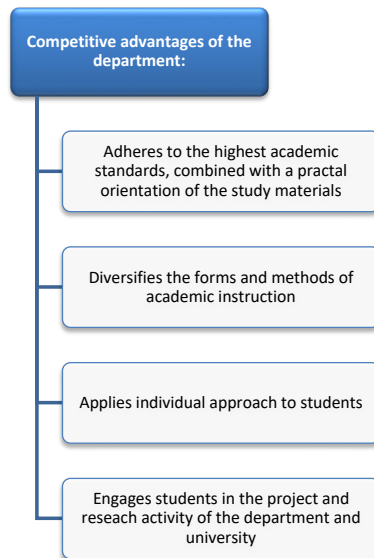


FIG. 6 - COMPETITIVE ADVANTAGES AT UNWE

The industry offers well-paid jobs, and university graduates are taken on in the logistics departments of manufacturing enterprises, trad-

ing firms and logistics service providers (transport, freight forwarding, warehousing, distribution, customs agency and others), and are promoted all the way up to top positions in the management board. The employment rate among the graduates of the Department of Logistics is almost 100%.

The department has 25 years of history. It was founded in 1991, which made UNWE the first school not only in Bulgaria but also in Eastern Europe to offer specialised training in logistics. The extensive experience of the professors from the Department of Logistics, as well as the cooperation with prominent universities from USA, Switzerland, France, Germany and the UK, plays a major role in building a contemporary educational content, and in the incorporation of the latest trends in the development of the theory and practice of logistics.

Since 2005 training in logistics has been carried out in compliance with UNWE's new strategy for applying the credit accumulation and transfer system that requires restructuring of the curriculum in both bachelor's and master's degree.

The department offers two highly competitive master's programs – "Supply Chain Management", with duration of two semesters for those who hold a bachelor's degree in logistics and "Business Logistics", with duration of three semesters for all kinds of applicants. The department offers a supply chain management master's degree in English for foreign students. The syllabuses meet industry demands and are developed after a detailed analysis of master's programs in logistics in universities from EU member states.

The PhD programme in Business Logistics has been accredited by NEAA twice with a high rating for a period of six years. Eight students, one of them a foreign national, successfully defended their doctoral thesis. Currently there are seven doctoral students.

The department admits yearly around 60 students in the bachelor's and 25-30 in the master's degree, and the latter have shown an upward trend. The vast majority of graduates is employed in diverse industry sectors and contributes to the development of logistics in the country.

The Centre for logistics training and research was established as an ancillary unit to the Department of Logistics by virtue of a decision of

the academic board from 8 November 2000. Its advisory board was set up by the department's academic staff and industry representatives. The Centre participates in the development and implementation of academic projects together with companies and other HEIs. Funds are raised from external organisations.

The department is a longstanding and active partner of companies from the industry. The constant contact with them ensures the exchange of valuable information and supports the educational process.

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

The mission, goals and tasks of the educational activity in UNWE is up to the standards of the present and future public needs. The significant change of the organisation and financing of the academic activity creates the necessary conditions for conducting highly-effective teaching in the various programmes in accordance with the scholarly standards of leading universities across Europe and the world.

UNWE holds a leading place among higher education establishments in Southeastern Europe, teaching students and conducting research in the fields of economics, management and administration, law and politics.

3.2. Specific Education Initiatives

The Department of Logistics launched a number of specific initiatives applying an innovative approach to teaching and research and their integration in industry. The wide range of teaching methods aims to ensure the high quality of educational and research practices.

New interdisciplinary approach to education and development of a competency-based approach to curriculum design

The Department of Logistics observes strictly regulated procedures for the development, approval, supervision and update of the curriculum documentation, taking into account the opinion of the students and the business. Since the 2008-2009 academic year, training in the bache-

lor's degree in business logistics has been carried out in compliance with the university's new strategy for admission in professional fields, sub-fields and specialties. It provides a wide-profile fundamental training and an opportunity for interdisciplinary learning in order to avoid the previous constraints of the narrow programmes. In their first two years of study, the students in Business Logistics, like all UNWE students, cover fundamental subjects, in the third year – the special subjects for the faculty, and in the fourth year – specialised disciplines in the field of logistics. The structure of the curriculum with its compulsory and optional courses allows for flexibility and adaptability of education to meet students' individual needs.

Case Studies

This is a method in which the professor simulates real situations that are part of the logistics business processes. In line with the bachelor's degree curriculum, training is split into lectures and seminars. During the seminars the lecturer divides the students into small groups tasked with solving a logistics problem. The purpose of discussing case studies, whether individually or in groups, is to stimulate independent thought and analysis of real situations and decision making, and to develop communication and presentation skills. The professor's goal is to put every student in a different setting with each new case in order to show other viewpoints and approaches to tackling a problem. Thus the students acquire the skills to apply theoretical knowledge in practice.

Ensuring the quality and relevance of education, research and technology transfer activities through Quality Assurance

A Quality management system is in place in UNWE, certified by Intertek, according to the international standard ISO 9001:2008. The system highlights the need to "determine the main processes and procedures in academic, research and ancillary activities, as well as the measurement, rating and monitoring the quality of teaching and academic

staff³⁸. The Department of Logistics regularly conducts surveys on the quality of education and teaching, based on the UNWE's QMS principles, among its students and the employers. Based on the surveys' findings, discussions are held and measures are taken to introduce or modify a practice.

Shared professorships and associate lecturers from industry

The principle of integrating education and industry, as two of the main pillars of the knowledge triangle, defines the specific approach towards teaching Business Logistics in both bachelor's and master's degrees. Attracting tutors from the logistics industry is traditional for the Business Logistics programmes. The department uses this well established practice in teaching – open lectures presented by professionals, practical presentations, for example the presentation of a “mobile” warehouse in a university hall that reveals to students the functioning of barcode systems, etc. Not long ago the department launched a new initiative called “Meet the business – be successful in logistics” with a series of monthly lectures presented by prominent logistics managers. The courses are scheduled in one of the technologically equipped study halls in UNWE. Presentations are thematically linked to the studied subjects, but highly practically oriented and give the students the opportunity to get to know the real industry processes first-hand. Those lectures are initiated by the Department of Logistics but are completely funded by the participating companies. The lectures are public, they are announced in advance on the website and on UNWE's shared intranet and are accessible to any of the interested parties. This is a well-established practice not only for educating students but also for promoting the department and the Business Logistics specialty to first and second year students that choose a specialty at the end of year two.

There are incentives for business professionals to take part in the education process: first, they want to share their experience and boost students' motivation. Furthermore they choose UNWE because of its rep-

38. Rectors' annual report for the period December 2015 - December 2016.

utation for excellence. These meetings also provide an opportunity to establish a direct contact between industry and the potential employees. Over the last seven years, new integration trend in the knowledge triangle has become evident – hiring regular lecturers with longstanding experience in the field of logistics. More than half the regular teachers in the department have more than 10 years of experience as managers in logistics. Hence academic teaching steps out of its traditional theoretical basis as it is enriched with real cases and personal practical experience.

Internship

The Department of Logistics works actively towards incorporating the practical experience in the teaching process. According to the bachelor's degree curriculum, the students are bound to complete before graduation 120 hours of internship as part-time employees in a company from the logistics sector or in the logistics department of a manufacturing or trading company. The goal is to reveal the application of the theoretical concepts in practice. The internship is led by a supervisor from the department and a person in charge from the company. "Guidelines for conducting an internship" are published on the departments' web-page to facilitate the students. There is also a suggested feedback form as well as criteria for evaluation of the student work. The contents of the guidelines are discussed in essence with representatives from the logistics industry. Their publication is financed by an Open society institute tender won by one of the logistics doctoral students. Business Logistics students benefit from the stable traditional relationships of the department with businesses and institutions and conduct their internships in companies such as Coca-Cola, Fresh Logic, SOMAT, LIDL, Grammer, Militzer and Munch, Discordia, World Transport Overseas, Gopet Trans, MW Logistics, etc. In 2013 the department launched an initiative to contractually bind companies to participate in student internships. Students benefit also from a number of already established agreements between UNWE and external organisations.

In order to support the practical training in the special disciplines, each term the Department of Logistics organizes a visit to company so

that students can acquire first-hand knowledge of the logistic processes in real life. Very often a firm is both a host and UNWE's guest to present a lecture to the students in Business Logistics.

Collaboration between education and industry is beneficial to students – it helps them acquire and cultivate practical skills so that they meet the labour market demands and make a proper and well-informed career choice, which facilitates the transition into employment. Such cooperation and partnership contributes to the improvement of the quality of education – through stimulating the creation of a stable partnership between the HEI and business it encourages the modernisation of the curricula and studied subjects in line with market needs. Furthermore, a sustainable recruitment mechanism for business is created.

Flexible PhD programs and Professorships for scientists

Studying in a PhD degree at UNWE is carried out in accordance with the traditional EU model – after graduating a master's degree.

The Department of Logistics boasts good practices in incorporating good teaching practices in the Business Logistics PhD program. The last has specific features in the context of the Bulgarian academic environment as it is the only one in Bulgaria with a 22-year history.

Admission specialty and foreign language exams help identify the best candidates.

In the Department of Logistics research is aimed to help resolve the issues at stake in the development of logistics in Bulgaria and this determines the program's highly specialised focus. Students are directed towards research on current topics at the different stages of science and practice in the domain of logistics.

Teaching in the doctoral program has found the balance between studying general economic and special subjects in the field of logistics and supply chain management. They are flexible and tailored to the individual needs of the researchers. The student decides how to combine academic and scientific programs in order to improve the efficiency and quality of the tasks performed – exams, publications, thesis preparation, and teaching.

The scientific progress of the doctoral students is encouraged via policies for participation in university, national and international projects and events and in different form (case studies, reports, surveys, etc.). Being the youngest researchers in the Department of Logistics they are involved in all its research projects and academic events. With their active participation, four research projects have been concluded in the field of logistics that are financed by UNWE's own research fund: "Condition and trends in the development of logistics in Bulgaria", "Challenges faced by Bulgarian logistics sector in the context of EU admission", "Development of logistics in Bulgarian manufacturing and trading companies", "Contemporary aspects of the development of logistics in Bulgaria". Through participation in these projects some of the department's doctoral students conduct their empirical studies as part of their final thesis. For the data analysis UNWE provides specialised software for statistical processing and information analysis.

The PhD researchers are involved in the teaching process by holding 60 hours of seminars with students studying Business Logistics. This is a sound approach for developing certain competences, presentation and communication skills. In recent years there is growing interest on the part of companies in education and research in logistics. The fact that managers from large logistics companies in Bulgaria and Europe, such as Overgas, Speedy, Coca-Cola, M&M, Agility Switzerland, are approached to participate in the teaching process is a testimony to that.

Talent development

The Department of Logistics gives professional support to prominent students by including them in all its research projects and events – experimental work on projects, participation in conferences, research and surveys related to education or logistics practice.

Globalisation of science and education

UNWE offers 10 programmes taught in English in the bachelor's degree. The number of available master's programs in English is increasing dynamically. UNWE is already part of the European academic commu-

nity and more accessible to foreign students and teachers. Since 2007 UNWE is a part of the joint master's degree "European Business and Finance" together with the Nottingham Trent University. Graduates receive both a Bulgarian and a full English diploma. Education is fully structured according to the English education system. UNWE is also involved in the work of the newly established Chinese-Bulgarian research and mobility centre in cooperation with the Jiao Tong University in Shanghai – the third largest university in China.

The Department of Logistics has its own specific pioneer contribution in internationalisation of education in logistics.

In 1997, UNWE signed (in favour of The Department of Logistics) a cooperation memorandum with the International Business School (IBS) in Lippstadt, Germany for training academic staff from the Department of Logistics, financial support from IBS, as well as the exchange of documents and know-how. The activities envisaged by this agreement are completely financed by IBS. As a result of this collaboration, the Centre for logistics research and training was created in 2000 (decision of the Academic Council of 8 November 2000).

In the period 1996-1999, the Department of Logistics took part in the European TEMPUS projects 11347-96 "Partnership between Bulgarian economic universities in the creation of a joint bachelor's program in Business Logistics". The participants in this project encompassed three Bulgarian universities: UNWE, University of Economics – Varna and the Academy of Economics – Svishtov and two EU universities: University of Savoy Mont Blanc, France and the University of Huddersfield, UK. Within the project's framework the participants developed documentation for a bachelor's program in Business Logistics. The regular exchange of teachers between the institutions contributes to the high quality of the education. The curriculum has been updated several times but most of the specialised disciplines are incorporated in its current version. The implementation of this bachelor's degree in Business Logistics is beneficial to the restructuring and globalisation of Bulgarian higher education in the field of economics and management.

The Department of Logistics has organised ten academic conferences "Logistics in a changing world" as a forum for discussing opportunities

and challenges for the development of logistics. Participants represent a wide range of countries, including Bulgaria, USA, UK, The Netherlands, France, Finland, Italy, Macedonia, Russia, Poland, Ukraine and Serbia. During these conferences different logistics associations were introduced, such as the Dutch NEVEM, the Italian and the Russian, as well as logistics practice in companies such as Phillips, DHL, Schenker, Speedy, Kuehne and Nagel, Eurosped, Coca-Cola, Frigo, Storact Log, M&M, and software solutions for managing logistics. The conference proceedings are widely used by both students and business.

This process of harmonising and integrating education, research and business practice in line with leading universities goes on for more than 20 years. A result of the internationalization of the logistics education is the creation of the Logistics Management programme in the University of Bitola, Macedonia that uses the model of the Business Logistics curriculum in UNWE. This initiative is a merit of a successful foreign PhD graduate in Business Logistics that now teaches in the University of Bitola.

3.3. Strategies and Support Systems for the Knowledge Triangle

Dedicated university offices for cooperation with external partners

The only Inter-university centre for career development (ICCD) in Bulgaria has been in operation in UNWE since 2002. The Centre acts as an intermediary between university students and business organisations. The mission of ICCD is to provide assistance to young people and students with their professional orientation and development during their years of study, and especially to those with disabilities. Through a regional unit of the European information network Eurodesk, based in UNWE, ICCD provides information on financing programs at the national and European level related to education, training, employment and extracurricular activities. ICCD in UNWE is awarded the “Career centre” prize by the “Human resources in Bulgaria and Euro integration” foundation and the “Human resources” magazine. Career consultants in ICCD in UNWE are certified according to the international Global Career Development Facilitator (GCDF) program, created in the year 2000 in the United States.

ICCD in UNWE realised two projects financed by the “Social aid” fund at the Ministry of labour and social policy – “Equal start for the dis-

abled students” and “Disabled students – one of us”. They give a chance to 40 young people with disabilities to improve their quality of life through career development and professional employment. The gathered know-how in working with young people in need is a responsible practice providing the basis for future initiatives.

Good example of integration in the Knowledge triangle is the annually organized by UNWE “Career days” in the following sectors – economics, finance, human resource, marketing, customer service and logistics. This job fair is a result of the mutual efforts of UNWE, ICCD and Job Tiger (Bulgarian web and a HR company).

A specialised unit for practical education was created in ICCD in 2015. A permanent task force consisting of academic representatives of the various departments’ works on common rules and procedures, as well as on the best practices related to the pre-graduate internship that is mandatory for UNWE students.

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

Collaboration in the field of education and science

The Department of Logistics has excellent traditions in setting and developing collaboration with other HEIs and industry organizations both in Bulgaria and abroad.

The scientific Centre for Logistic Research and Education (CLRE) that is created as an ancillary unit to the department deals with studying current issues in logistics and training in logistics and supply chain management. The Advisory board of CLRE is made up of teachers from Logistics department and industry representatives. The projects run by the centre are financed with external funding. It develops and implements science project in collaboration with business.

An example of a good practice is the course in Logistics organised by CLRE in 2007 for 25 managers from CEZ Bulgaria EAD. The course had duration of three months and was financed by the company. It was carried out by the department’s academic staff.

As a product of the internationalization and integration of the logistics education in the knowledge triangle is the five-month course on logistics and supply chain management, organised in 2007-2008 by CLRE, in collaboration with Italian logistics association (AILOG). The course was funded by the Italian ministry of foreign trade and the Italian institute for foreign trade (ICE). The participating 36 individuals were all employed by companies in Bulgaria as logistics specialists. The lecturers were from AILOG – university professors and professionals as well as from UNWE's Department of Logistics. Each attendee ended the course with a practical project that could be implemented in the activity of the respective employer. Upon successful completion of the training, certificates were granted to participants by AILOG, ICE Sofia and CLRE. The six best performers were awarded a practicum in the warehouses of Lavazza and Volkswagen Group Italia. Apart from the course itself, the joint program also ended up with the publication of a bilingual Italian-Bulgarian and Bulgarian-Italian glossary of logistics terms. Academic community, trainees and business have all appreciated highly the benefits of the course.

The outcome and benefits from the integrated learning are:

- establishing and maintaining contacts between academic community and logistics professionals in Italy;
- professional advancement of the trainees;
- involvement of the Italian partners in the department's conference "Logistics in a changing world";
- transferability of the approach to other Bulgarian universities (Sofia University).

To support the internships as a part of the curriculum, the Department of Logistics teams up successfully with the Bulgarian logistics association for the launch of a job-search website specialised in logistics positions – <http://logisticsjobs.bg/>. The platform is attractive to employers who can promote jobs in logistics and for logistics professionals or students who can focus their search on an internship or a new job in logistics. It is the first platform of this kind in Bulgaria that has the following advantages:

- It promotes logistics jobs in the biggest database for logistics professionals in Bulgaria;
- It is targeted at people with practical experience and/or education in logistics and supply chain management;
- It offers announcements in nearly 20 categories specific for logistics;
- It announces job vacancies only in the area of logistics and supply chain management.

Mobility

In 2017, when the Erasmus programme marked its 30 year anniversary, the Centre for student and teacher mobility in UNWE celebrates 17 years of active participation in the exchange of best education practices between European schools. Student and teacher mobility is one of the best ways to develop professionally the students and the academic community through command and transfer of foreign knowledge.

The internationalisation of the Business Logistics degree is aided by the exchange of academic staff with universities from Italy, Poland, France, Germany, Slovenia, and Spain mainly in the frame of the Erasmus and Erasmus Plus programs. Through recognition of the strengths of the partner institutions and application of best foreign practices, the departments' academic personnel, students and administrative staff improve their professional skills and competences for the sake of education quality. The teaching mobility lays the foundations for a more profound collaboration related to the department's research activity. In the context of the Erasmus program, UNWE's Department of Logistics assisted in signing cooperation agreements with the faculties of logistics of the WSB University in Gdansk and the University of Maribor.

4.2. Strategic cooperation agreements with industry

Research collaboration / Innovation Centres

The Department of Logistics has established, maintained and developed partnerships with potential consumers of the research output. For

the period 2009-2016 doctoral students and professors from the academic body of the unit have participated in the development of applied projects aimed at specific economic entities. Four such research projects are concluded and financed by UNWE's research fund. Each one contains case studies developed by business professionals. The research "Contemporary aspects in the development of the logistics sector in Bulgaria" suggested ways for extending the portfolio of logistics services that were subsequently implemented in practice.

Doctoral Schools for Research & Innovation

The Association of doctoral students in Bulgaria (ADSB) was established in 2003. It was launched, created and presided over for many years by a graduate of the Department of Logistics who is now part of the academic body. The mission of the association is to defend the interest, professional development and to assist the doctorate students in Bulgaria. One major goal of the organisation is to achieve a wider range of mobility opportunities and increased knowledge in the respective fields, including logistics and to increase the adaptability and competitiveness of the Bulgarian doctoral students in the context of the integrated European labour market. This is to be accomplished via the creation of a vast collaboration network of Bulgarian PhD community. ADSB promotes the benefits and aftermaths of academic exchange. It is an official member of Eurodoc (European Council of Doctorate Candidates and Junior Researchers).

Section 5-6: Main challenges, enabling factors & Future Developments and Transferability

Involving business professional in the academic process alters the essence of higher education. Joining the forces of the department's academic staff with those of the practitioners is a well-established good approach in the educational process. This method has been tested in the new joint initiative of the department and MW Logistics, called "Logistics manager for a day". The idea of the initiative is to encourage and assist outstanding students by placing them in a managerial context in a real logistics company or logistics department for a day. The initiative

also seeks to attract other companies. It will quickly establish itself as a good way to achieve the desired improvement of business logistics competences, to acquire real process analysis skills and to develop a keen sense of teamwork and versatility in different settings.

The trend to recruit mainly young scientists or experienced individuals for regular lecturers in the department will continue. The programmes “Business logistics” and “Supply chain management” are under a process of certification by the European Logistics Association (ELA) for the qualification standards Candidate European Junior Logistician – cEJLog and Candidate European Senior Logistician – cESLog. This will increase the work performance of graduating students.

The current efforts are focused on a number of tasks: together with business partners to set up a Council Board at the department; to develop a “Mentor’s” program in which managers supervise students and guide them in the course of their studies through professional counseling; to start certification of companies that support research and education development in the field of logistics.

Section 7: Lessons learnt and recommendations

The Business Logistics and Supply Chain Management degrees in UNWE combine theoretical with practical approaches which in turn improves the quality of the gained knowledge. The Department of Logistics is committed to providing academic training that ensures the high level of education, experience and analytical skills.

Among the department’s priorities is to attract part-time lecturers from business that provide at least 10% of the teaching hours for a given discipline in the master’s degree. BLA, which already offers a virtual job search platform, can improve it by adding topics of lectures from which the business representatives may choose to apply for participation in the students’ practical training.

The Department of Logistics works towards raising the awareness of undergraduate, graduate and doctoral students of the available initiatives in and around the university. For example, young researchers can submit applications to obtain funding from UNWE’s research fund. This opens up the opportunity to provide funding for

individual projects, whether a PhD thesis or a project of an assistant professor.

An ever growing number of young people prefer to take up distance learning that allows them to better organise their spare time and combine work with education. Given this trend, the academic staff of the Department of Logistics should consider the possible elaboration of a curriculum for distance learning.

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5.5. *Montanuniversitaet Leoben, AUSTRIA*

Section 1: Introduction

1.1. National and Regional Framework/Context

The Austrian province of Styria has a high concentration of companies with a focus on logistics technology. Some of the leading European companies in warehouse management software, warehouse automation and RFID technology are based in and around the city of Graz. Furthermore, the Technical Universities in Graz and Leoben are focal points in logistics technology education and research.

1.2. University Establishment

Montanuniversitaet Leoben has its origins in 1840, founded as the "Styrian Corporate School of Mining". Current fields of studies include Mining Engineering, Metallurgy, Plastic Engineering, Materials Science, Applied Geosciences, Industrial Environmental Protection and Industrial Logistics. Competences have developed along the value chain.

1.3. Organizational structure and Governance

Established in 2003, the Chair of Industrial Logistics at the Montanuniversitaet Leoben (MUL) integrates engineering education and education in logistics management with a high degree of practical experience. It has developed a unique profile in education and training, as well as in industry and research projects.

1.4. University research and education

MUL main expertise is Industrial Logistics with a special focus on logistics systems design and engineering, material flow management, process optimization, production planning and control, warehouse automation and information flow management.

The study of Industrial Logistics at MUL combines a technical with an economic focus on logistics to form this special study profile. The Master program in Industrial Logistics provides an education which enables graduates to cover a broad range of applications within their job portfolios. Moreover, four specializations are offered within the Master program: Logistics Management, Logistics System Engineering, Computational Optimization and Automation.

Areas of competence include:

- Supply Chain Strategy
- Logistics Systems Engineering
- Warehouse Automation
- Logistics Process Modelling and Optimization
- Information Logistics, Information and Communication Technology
- Industry 4.0 in Logistics
- Material Flow Management
- Production Logistics
- LogiLab Laboratory

Section 2: Parties involved in the Knowledge Triangle

Montanuniversitaet Leoben (MUL), Chair of Industrial Logistics: see above

KNAPP Systemintegration, Leoben: KNAPP Systemintegration is specialist for end-to-end logistics solutions in complex and highly au-

tomated warehouse areas. The company's core competencies lie in the conceptualization and development of complete logistical solutions and their realization as system supplier and general contractor.

SSI SCHAEFER, Friesach: With more than 900 employees specialized in software and approximately 1400 installed systems, SSI SCHAEFER is one of the largest logistics providers worldwide. Their logistics software offers transparent control and monitoring functionalities as well as an integration of the systems in intralogistics processes. From manual to fully automated, the software cover all logistical areas within a warehouse.

Bundesvereinigung Logistik Österreich (BVL Austria): BVL is the leading logistics association in Austria, representing the major companies in industry, retail and logistics services. Their annual conference has been established as a platform for logisticians over 32 years, with more than 700 participants. BVL operates competence centres in automotive logistics, transport, industry, retail, sustainable logistics and logistics automation.

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

Through close collaboration between the parties involved, educational programs were developed for university and business. Researchers, teachers and logistics practitioners complement each other to create innovative education models.

Practitioners of the two companies teach in special courses at the university and bring in their expertise.

Universities and companies jointly develop and implement training programs on new innovative topics and technologies.

The companies support the establishment of a logistics lab at the university by providing technology and software.

Students do internships in the companies, a number of them were employed by the companies after graduation, building a further bridge.

The logistics association is responsible for quality assurance of the courses. As a next step, an accreditation of courses following the European Logistics Association (ELA) Standard for Logistics Competence is planned.

3.2. Specific Education Initiatives

- Establishing an in-house training program for SSI SCHAEFER, developed and taught by the university (5 modules).
- A course on 'Special logistics applications', provided for the university by experts from both the companies, as associate lecturers from industry.
- Establishment of a regional logistics conference in cooperation between BVL, KNAPP, SSI SCHAEFER and Montanuniversitaet Leoben.
- The Bachelor Program in Industrial Logistics (Montanuniversitaet Leoben) is a dual program combining study and work experience. At least one semester of internship is required. Moreover, bachelor theses are developed jointly with industry.
- The Logistics Lab Montanuniversitaet Leoben serves as an interdisciplinary center for research and development.
- Internships for students.

3.3. Strategies and Support Systems for the Knowledge Triangle

BVL as an association serves as a neutral platform facilitation cooperation between the partners, some of which can be competitors in the marketplace. In regular meetings (bi-monthly) the cooperation is developed further.

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

- Close collaboration in the field of education.
- Mobility between university and industry – practitioners teach, researchers/teachers from university assist in developing company education.

4.2. Strategic cooperation agreements with industry

- Regional competence centre of BVL Austria in collaboration with industry.

Section 5: Main Challenges, Key Success and Enabling Factors

Key factor for success is cooperation based on trust.

Section 6: Future Developments and Transferability

The training program can easily be transferred to other companies in the logistics field, both industry and logistics service providers.

The Logistics Lab will be further developed by integration of new technologies and solutions in the field of identification technology and simulation.

Accreditation of the program will strengthen further development and ensure compatibility with the ELA Standard.

Section 7: Lessons Learnt and Recommendations

Bringing research, industry and education together provides good synergies and benefits for all the parties involved. The partnership is now firmly established, with mobility between university and industry both ways. An association is useful as a neutral point of reference, able to drive initiatives which are not profit-oriented.

Section 8: Contacts and References

Prof. Helmut Zsifkovits, Montanuniversitaet Leoben, Chair of Industrial Logistics, helmut.zsifkovits@unileoben.ac.at.

Franz Leitner, KNAPP Systemintegration, Leoben, CEO, franz.leitner@knapp.com

Peter Totz, MSc, MBA, SSI SCHAEFER, Friesach, Director Business Consultancy, peter.totz@ssi-schaefer.com.

Günther Proksch, Mag., SSI SCHAEFER, Friesach, HR Business Partner, guenther.proksch@ssi-schaefer.at.

Roman Stiftner, MSc, President, BVL Austria, Vienna, roman.stiftner@wko.at.

Wolfgang Kubesch, CEO, BVL Austria, Vienna, wolfgang.kubesch@bvl.at.

5.6. Hull University Business School, UK

Section 1: Introduction

1.1. National and Regional Framework/Context

The Hull University Business School is a leading UK business school dedicated to the development of responsible leadership for a complex

world. The Hull University is in the top 10 universities in England for employability. In a recent survey, an impressive 98% of international graduates were in work or further study within six months of completing their undergraduate course. And 97% of those were in graduate-level work or study.

1.2. University Establishment

In the Faculty of Business, Law and Politics is Hull University Business School with the following study programs:

- Accounting and Finance
- Economics
- Management Systems
- Marketing and Business Strategy
- Organizational Behavior/Human Resource Management

1.3. Organizational structure and Governance

Founded in 2005, the Logistics Institute is a world-class center of excellence in global logistics and supply chain management.

The Institute was established with £20 million in funding from Yorkshire Forward (a regional development agency) and the European Regional Development Fund (ERDF). This funding, which ended in December 2007, enabled the creation of the institute that provide logistics training, support and consultancy.

From its foundation, the institute assisted 530 businesses with their logistics and supply chain issues. These businesses created over 160 new jobs and increased sales by £55 million per year.

The institute is unique in offering logistics degree courses, research, business consultancy and training, and community engagement.

1.4. University research and education

Hull Research

The University research results are internationally recognized. The areas of research are:

- Creative Economy
- Connected Communities – Economic and Social Regeneration
Health and Well-Being

- Global Economy & Security
- Ethics and Social Justice
- Energy and Environment
- International Maritime

Section 2: Parties involved in the Knowledge Triangle

1. Hull University Business School
2. The Logistics Institute that offers an interrelated suite of activities comprising membership, events, short courses, consultancy, academic degree programmes, technology development, and demonstration and business incubation space.

The consultancy and research services have been enhanced following the development of a Logistics Institute at the university, which aims to establish and embed a world-class centre of excellence in global logistics, supply chain management and related technologies.

The Logistics Institute is working in conjunction with the World Economic Forum Global Agenda Council on the Future of Logistics and Supply Chains, to produce an innovative report on the impact of the Internet of Things (IoT) in the industry.

Hull University Business School holistic perspective is providing fresh insight to public and private sector organisations of all sizes at a regional, national and international level, achieving tangible results for business.

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

The collaboration between the parties involved help in developing educational programs useful for university and business.

3.2. Specific Education Initiatives

With extensive expertise in emerging technologies such as Automatic Identification and Data Capture (AIDC), item attendant data and Radio Frequency Identification (RFID), the Logistics Institute can assist with their integration into the supply chain, including asset management and security.

Another initiative of the Logistics Institute was "the building of a Virtual Game to Create Logistics Awareness in Our Youth: The Xbox Kinect Project", a project developed in the period: 10/1/12 - 6/30/13. The UK logistics industry is worth £74.45 billion to the UK economy and employs around 2.3 million people in over 196000 companies (Skills for Logistics, 2010). One in twelve working people in the UK works in logistics. Freight logistics companies either manage their own distribution system (own account operators), or manage it on behalf of another as 'third-party logistics' (3PL) or 'haulers'. Over 60% of UK freight is carried as 3PL (prospectus.co.uk). However, universities see little or no uptake by British students on logistics and supply chain courses. The University of Hull is no exception, with the majority of students, both undergraduate and postgraduate, coming from abroad. Industry is also asking where the next generation of logistics professionals will come from. The UK Warehousing Association (UKWA) fears that logistics companies may soon face a serious skills shortage as too little money is currently being spent on the next generation of supply chain workers (2011).

The objective of this research was to create a Virtual Logistics Game using the XBOX Kinect platform in order to generate higher levels of logistics awareness among school age children. Research attempted to measure shifts in awareness of an industry that employs over two million people.

The Logistics Institute is working in conjunction with the World Economic Forum Global Agenda Council on the Future of Logistics and Supply Chains, to produce an innovative report on the impact of the Internet of Things (IoT) in Logistics and Supply Chains industry.

Students at the Institute and Business School, which teaches post-graduate and undergraduates programmes in logistics and supply chain management, have the opportunity to work on case studies and research for the project with the World Economic Forum Council.

The study explores the connectivity enabled by:

- the internet which allows global movement of data and information;
- the internet of things (devices and sensors connected to the internet) that capture data from and provide information to various entities of supply chains;

- cloud computing which allows almost unlimited data storage and computing power.

3.3. Strategies and Support Systems for the Knowledge Triangle

The relationship between the Hull University Business School, the Logistics Institute and the World Economic Forum Council is a collaboration that will be developed also in the future for the benefit of all parties involved.

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

The World Economic Forum Council has appointed the Logistics Institute to work on a prestigious strategic supply chain study.

Being a part of this globally collaborative World Economic Forum Global Agenda Council on the Future of Logistics & Supply Chains backed research initiative and for an organization's innovation will establish the potential for supply chain and logistics companies around the world to truly harness the Internet of Things (IoT) for cost efficiencies, and improved service delivery within those sector.

The companies can benefit from the global academic expertise of the Logistics Institute, drawing on innovative and industry relevant research, and a portfolio of training and management development programmes, adding real value to those organizations.

4.2. Strategic cooperation agreements with industry

The Institute will conduct research and analysis of computing and data transmission networks to inform supply chain strategy relating to the allocation of resources, synchronisation of capabilities and automation of supply chain components.

A series of logistics offers of the Logistic Institute, in relation to the industrial environment are as follows:

- Asset management and tracking (ILC)

The ability to track assets and goods is a key element of efficient logistics and supply chain management. The Logistic Institute offers

impartial advice on how to incorporate appropriate technologies into company operations to improve efficiency and reduce errors.

- Radio-frequency identification (RFID) systems planning, development and testing

The extensive experience of the Logistic Institute in radio frequency technology enables it to design, implement and test RFID systems to determine the most suitable identification method to meet specific business needs.

- Wireless communications for logistics

The Logistic Institute can provide the expertise to allow an organisation to incorporate existing and emerging wireless technologies into its logistics applications. Wireless technologies, including General Packet Radio System (GPRS), Cellular Mobile, Push-to-talk (PTT), WiFi and WiMax, or radio technologies, such as Bluetooth and GPS, can all be built in to current or future systems and tailored to meet specific needs of companies.

- AIDC technology selection and evaluation

Non-radio logistics technologies can often offer advantages in terms of cost or ease of implementation. The Logistic Institute can match the appropriate technologies, such as Barcoding, to organisational needs and verify the choices made in a controlled test environment.

Section 5: Main Challenges, Key Success and Enabling Factors

The relationship between the partners in the Knowledge Triangle is until present a success in logistics. The educational and research offer of the Institute of Logistics, applied to the industrial area, is very diversified (<http://www.hull.ac.uk/faculties/fblp/more/business-engagement>) and this is a key aspect of success for the Institute.

Section 6: Future Developments and Transferability

With almost endless data provided by the internet of things, almost unlimited data storage and computing capability, and an internet that

is rapidly becoming available almost everywhere, the challenges are to determine which things to connect, what data to capture, what tools to build and what issues to address with all of this rapidly evolving capability in order to provide the greatest value.

The World Economic Forum Council on the future of supply chains and logistics, which strives to raise awareness regarding the importance of supply chain strategy, will report on the study to both, business and government.

While traditionally a consulting firm is appointed by the council to collaborate with members of the council in research and analysis, the Logistics Institute will bring high-calibre academics who are internationally recognised for their research into retail and supply chain operations and management.

Section 7: Lessons Learnt and Recommendations

Bringing research, industry and education together provides good synergies and benefits for all the parties involved. An association is useful, able to drive initiatives which are useful to Higher Education, Research and Business.

Section 8: Contacts and References

1. Hull University Business School has facilities at both, Hull and Scarborough campuses, of the University of Hull. <https://www.youtube.com/watch?v=bRX-vkHJwQ3o>.

Faculty of Business, Law and Politics: Hull University Business School +44 (0)1482 463010 <https://www.hull.ac.uk/faculties/subjects/business-management>.

2. Director of the Logistics Institute, Hull University Business School:

Professor Amar Ramudhin

Contact Details: Nidd Building 202

Phone: +44 (0) 1482 46 3084

Email: A.Ramudhin@hull.ac.uk

5.7. Jönköping University, SWEDEN

Section 1: Introduction

1.1. National and Regional Framework/Context

Jönköping is a city in southern Sweden with 93797 inhabitants.

Jönköping is situated at the southern end of Sweden's second largest lake, Vättern, in the province of Smaland.

The city is the seat of Jönköping Municipality, which has a population of 134785 and is Smaland's most populous municipality. Jönköping is also the seat of Jönköping County which has a population of 341235.

The Science Park is founded through the Municipality of Jönköping and Habo, Jönköping University, the Region Jönköping. The Science Park meets 1000 new business ideas every year and contributes to the start of 300 new companies. There run a business incubator with 18 companies, a venture capital company and a regional business network.

With business developers and offices in all of the thirteen municipalities in Region Jönköping, the Science Park supports the region in becoming one of Sweden's most interesting places for entrepreneurs.

1.2. University Establishment

Jönköping University is a young professional-oriented university characterized by a high degree of internationalization, an entrepreneurial spirit and extensive collaboration with surrounding society. It is one of three Swedish private, non-profit institutions of higher education with the right to award doctorates.

Jönköping University has around 10000 students, of which 1500 are international students. The university is one of the top universities in international student exchange and among the best in Sweden in terms of attracting international students. Campus has an international and academic environment with students and staff from all parts of the world.

Both within education and research, Jönköping University has a close cooperation with business and society.

Jönköping University is one of three Swedish private, non-profit institutions of higher education with the right to award doctorates. Jönköping University operates on the basis of an agreement with the Swedish Government and conforms to national degree regulations and quality requirements.

Jönköping International Business School (JIBS) is a young dynamic institution. JIBS' first students were enrolled in 1994 and in the last

twenty years JIBS has grown to a comprehensive institution offering Bachelor, Master and Doctoral education.

Since its inception, JIBS has become world-renowned in a number of research areas related to its educational programmes.

JIBS is uniquely organized as a limited company owned by the Jönköping University Foundation.

1.3. Organizational structure

A. Jönköping University offers Doctoral Programmes in English, available for international students with the required qualifications. Doctoral education is conducted at all four schools and the university has about 180 doctoral students.

Jönköping University is entitled to award Licentiate and Doctoral degrees within the Humanities and Social Sciences. Some of the subjects for research studies in the Humanities and Social Sciences are: Business Administration, Commercial Law, Economics, and Statistics.

B. Master's Programmes

- International Logistics and Supply Chain Management
- IT, Management and Innovation
- Strategic Entrepreneurship
- Managing in a Global Context
- Digital Business
- International Financial Analysis
- International Marketing
- Engineering Management
- Economic Analysis
- Production Development and Management
- Sustainable Building Information Management

C. Undergraduate Programmes

- Sustainable Supply Chain Management, Bachelor programme
- International Management, Bachelor programme
- Marketing Management, Bachelor programme
- Sustainable Enterprise Development, Bachelor programme
- International Economics, Bachelor programme

1.4. University research and education

Jönköping University: Jönköping International Business School.

Within Jönköping University there are a number of centers and Institutes:

- Centre for Family Enterprise and Ownership (CeFEO)
- Centre for Entrepreneurship and Spatial Economics (CEnSE)
- Centre of Logistics and Supply Chain Management (CeLS)
- Center for Finance and Governance (CFG)
- Media Management and Transformation Centre (MMTC)
- Centre of Excellence for Science and Innovation Studies (CESIS)
- Centre for Information Technology and Information Systems (CenITIS)

Section 2: Parties involved in the Knowledge Triangle

1. Jönköping University, Sweden. The university has different Research Groups: each of the four schools has its own designated focus areas and research activities. In some fields research is conducted in collaboration between two or more of the schools.

2. Centre of Logistics and Supply Chain Management (CeLS) is a research and learning center within the field of logistics and supply chain management at Jönköping International Business School in Sweden. In its work CeLS is in close cooperation with both the industry, the local and regional municipalities, as well as with other national and international universities.

The aspiration of CeLS is to be a leading center for knowledge development within logistics and supply chain management (SCM) and to continuously develop excellence in research and thereby also contribute to the development of the research field.

Collaborations with business and society are an important activity at Jönköping University.

Jönköping University collaborates internationally, nationally, regionally and locally, through student projects, research collaborations, customized courses and participation in different networks.

3. One of the major partners is Science Park Jönköping. There, students and staff at Jönköping University get help shaping their business ideas into actual businesses.

During 2014 Jönköping University started a number of national collaborative projects in order to strengthen strategic interactivity between universities and society in Sweden.

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

The collaboration between the parties involved helps in developing educational programs useful for university and business.

3.2. Specific Education Initiatives

Jönköping University is strongly engaged in the development of Science Park Jönköping which provides support for the start-up, development and growth of business ventures.

Jönköping University encourages students and staff at the university to start new businesses, and is therefore supporting the activities at Science Park financially, which means the students can access the resources for starting and developing a new enterprise free of charge. About 250 ideas from students and researchers were handled in 2015 and about 70 enterprises were started by the university's students.

Situated close to campus, Science Park is a meeting place for business representatives and new ventures. Here they can find common ground for development and collaboration, and take advantage of the close connection to the university.

In 2012 the Science Park celebrated 10 years. There are some 100 businesses, new and well established, in the park. Since the start in 2002, the Science Park has met about 2800 business ideas and contributed to the launch of almost 1000 companies.

3.3. Strategies and Support Systems for the Knowledge Triangle

The relationship between the Science Park and the university is a collaboration that will be developed also in the future for the benefits of all parties that are involved, including students.

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

Jönköping University collaborates internationally, nationally, regionally and locally, through student projects, research collaborations, customized courses and participation in different networks.

4.2. Strategic cooperation agreements with industry

The Centre of Logistics and Supply Chain Management at Jönköping International Business School in Sweden is in close cooperation with both the industry, the local and regional municipalities, as well as with other national and international universities. One of the major partners is Science Park Jönköping. There, students and staff at Jönköping University get help shaping their business ideas into actual businesses.

Section 5: Main Challenges, Key Success and Enabling Factors

One important activity of the Centre of Logistics and Supply Chain Management (CeLS) is to present and discuss the results of the research with industry, public and commercial organizations, through seminars and workshops. CeLS also develops and teaches programmes and courses within the field of logistics and supply chain management to master students and executives.

Jönköping University encourages students and staff at the university to start new businesses therefore support activities at the Science Park financially. Being close to campus, the Science Park is a meeting place for business representatives and students. At the Science Park they can find common ground for development and collaboration, and take advantage of the close connection to the university.

Section 6: Future Developments and Transferability

The model of collaboration can be easily transferred to other companies in the logistics field, industry, logistics service providers and universities.

Section 7: Lessons Learnt and Recommendations

Bringing research, industry and education together provides good synergies and benefits for all the parties involved. An association is useful, able to drive initiatives which are useful for all the parties that are constituting the Knowledge Triangle: Higher Education Institutions, Research Institutions and Businesses.

Section 8: Contacts and References

Jönköping University

Gjuterigatan 5, Box 1026

551 11 Jönköping, Sweden

Phone: +46 36 10 10 00

Email: study@ju.se

Centre of Logistics and Supply Chain Management (CeLS)

Director: Susanne Hertz

E-mail: susanne.hertz@ju.se

Room B6026, Telephone: +46 36-10 18390

Business Developers: Tobias Dahlberg, +46 (0)36 30 5161 or Calle Andersson
+46 (0)36 30 51 64

Marketing Manager: Cecilia Ödman / +46 (0)36 30 51 65

Website: <http://sciencepark.se/english>

5.8. Politecnico di Milano School of Management, Observatory on Contract Logistics, ITALY

Section 1: Introduction

1.1. National and Regional Framework/Context

Osservatorio Contract Logistics is part of the Observatories on Digital Innovation system by Politecnico di Milano School of Management (MIP). Both Politecnico di Milano, MIP and the Observatories on Digital Innovation bear the highest national relevance.

1.2. University Establishment

Politecnico di Milano was established in 1863; the Observatories on Digital Innovation were set up in 1999; Osservatorio Contract Logistics was established in 2011.

1.3. Organizational structure and Governance

The Contract Logistics Observatory is managed by a Board of Directors composed of four members:

- Gino Marchet, Full professor, Department of Industrial Engineering - Scientific Officer
- Andrea Fossa, external consultant - Scientific Officer
- Marco Melacini, Associate professor, Department of Industrial Engineering - Research Director
- Damiano Frosi, scholarship fellow, Department of Industrial Engineering - Partner and Sponsor Relationship Manager

1.4. University research and education

Research is the main objective of the **Department of Industrial Engineering (DIG)** of Milan Polytechnic. Research at DIG is described in terms of Research areas and Research lines.

Research areas refer to disciplinary competences developed over the years at DIG in the three broad fields of Management, Applied Economics and Industrial Engineering.

Research lines comprise multidisciplinary research activities representing the future research strategies of the Department by addressing significant emerging issues and challenges. All research lines share the emphasis on innovation, entrepreneurship and advanced use of technology as key drivers for competitiveness and industrial leadership.

The following are the current research lines:

- **Manufacturing for industrial leadership** - developing technologies, strategies and organization to foster Europe's welfare through a new centrality of manufacturing
- **Supply chain management for sustainable and global business** - developing competitive and sustainable supply chains for a better society

- **Risk governance and business resilience** - how to cope with complexity and uncertainty in systems and organizations
- **Managing ICT for business, industry, government and society** - leveraging on information and communication technologies to increase companies competitiveness, better public services and a more sustainable and inclusive society
- **Energy management, policy and economics** - applied and advisory research towards more secure, clean and efficient energy
- **Public service innovation** - institutional and organizational changes for a better society and a more competitive economy
- **Health care management** - models, tools and policies for improving the sustainability, efficiency and safety of healthcare organizations and their clinical outcomes
- **Open and collaborative innovation** - how to manage strategy, organization, technologies and communities to increase innovation propensity in companies through open and collaborative innovation
- **High-growth entrepreneurial ventures and SMEs** - how to manage, finance and promote the creation of entrepreneurial ventures and the innovation of high-growth SMEs
- **Fostering competitiveness of national and local systems** - promoting the competitiveness of national and local systems through internationalization and innovation

A goal, common to most of the research fields at DIG, is to propose business models, industrial solutions, strategies, technologies and policies to foster sustainable development of companies, industrial systems and societies, by overcoming performance trade-offs among the three pillars of environment, society, and economy.

Finally, DIG research is aimed at producing excellent science in the three fields listed above though a particular research approach characterized by multidisciplinary, multiple methodologies and leveraging on networks.

Teaching is carried out by the professors of the Department of Management, Economics and Industrial Engineering, and covers the following areas/diplomas:

- **BS and MS courses in Management, Economics and Industrial Engineering**
- **PhD Programme in Management, Economics and Industrial Engineering**
- **MIP, the Business School of Politecnico di Milano**

DIG bears the responsibility within Politecnico di Milano for teaching the specializing courses that can be studied in the Management, Economics and Industrial Engineering curriculum. It also underpins a wide range of other courses offered by Politecnico di Milano.

DIG is the centre for the Doctorate of Research in Management, Economics and Industrial Engineering (DRIG), a training path for research in the fields of management, economics and industrial engineering.

The Department of Management, Economics and Industrial Engineering, with MIP Politecnico di Milano Graduate School of Business, is part of the School of Management of Politecnico di Milano.

Research at **Observatory on Contract Logistics** focuses on all issues of logistic outsourcing in Italy, from strategic outsourcing decisions to tactical outsourcing approaches.

Particularly, the Observatory measures:

- Quantitative data
- Evolution, trends and business sectors in which logistics is outsourced
- Role of technology and organizational innovation

Section 2: Parties involved in the Knowledge Triangle

1. *HEI*: Politecnico di Milano Department of Industrial Engineering (DIG)
2. *RESEARCH*: Observatory on Contract Logistics
3. *BUSINESS*: a group of 20 companies, partners of the Observatory, which pay an annual membership fee.

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

- Problem-solving mind-set

- Passion for technology, innovation and change
- Engaging and collaborative approach

3.2. Specific Education Initiatives

- Short executives courses (2-3 days)
- No specific initiative is planned at undergraduate level; while workshops are organized to transfer outcomes of the Observatories to Business School students

3.3. Strategies and Support Systems for the Knowledge Triangle

A very selective approach is adopted: only Business School students can benefit directly from the outcome of the Observatories, while contamination with undergraduate courses is kept to a minimum.

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

No particular extensive university-research-industry partnerships are established.

4.2. Strategic cooperation agreements with industry

Contract Logistics Observatory maintains three types of collaboration agreement with Companies:

1. **Partnership:** Logistic Service Providers and Technology providers who pay an annual membership fee and participate in all the meetings, workshops and research activities, and make a presentation during the Observatory annual main conference.

2. **Sponsorship:** Logistic Service Providers and Technology providers who pay to participate in the research activities and to advertise their products and services at the Observatory annual main conference.

3. **Industries and large retailer participate in the research** free of charge though their Logistics departments.

Section 5: Main Challenges, Key Success and Enabling Factors

The main difficulty encountered is that the data collected during the research activities becomes obsolete very quickly. Therefore, it is neces-

sary to update the data very frequently in order to get valuable information for the business.

Section 6: Future Developments and Transferability

The results from the research can be transferred to Executive courses, conferences, undergraduate university courses with ad hoc changes.

Section 7: Lessons Learnt and Recommendations

No specific lessons learnt and recommendations.

Section 8: Contacts and References

Osservatori Digital Innovation - School of Management del Politecnico di Milano
Campus Bovisa
Via Lambruschini 4B - Edificio 26B, 20156 Milano
Barbara Balabio
comunicazione@osservatori.net

5.9. Budapest Metropolitan University, HUNGARY

Section 1: Introduction

1.1. National and Regional Framework/Context

Budapest Metropolitan University is the biggest private University in Hungary and a point of reference for the higher education in the whole country.

1.2. University Establishment

Budapest Metropolitan University is an accredited private institute of higher education and the biggest higher institution in Hungary with a community of about 8000 students. As the Budapest College of Communication and Business, it had offered regular and correspondence BA courses in business communication, international communication, a joint degree in communication (journalism) and European public service and business administration between 2001 and 2005. The university was accredited as an adult education institute, as well, in 2003.

1.3. Organizational structure and Governance

Budapest Metropolitan University is managed first of all by the leadership that works actively towards the achievement of this goal, in an open, innovative and competitive atmosphere, and is composed of the Rector, CEO and Deputy CEO-Vice Rectors, and several Directors.

The Senate is a decision-making and supervisory body with duties and a scope of competence as specified in the Deed of Foundation and the Organizational and Operational Statutes. The Senate is responsible for defining the activities of the University, especially its training and research tasks, and its operations, and also supervises their implementation. The Senate consists of 11 members. If only a maximum of one fourth of the students with a vote take part in the annual Student Union elections, the Student Union is not entitled to send the 2 additional delegates. The official members of the Senate are the Rector and the President of the Student Union, while the elected members are the representatives of the leading lecturers and researchers of the Arts and Communication Faculty (3 persons), of Heller Farkas Tourism and Business Faculty (3 persons), of other University staff (1 person) and delegates of the Student Union (2 persons). The Secretary General is in charge of the managerial and administrative tasks pertaining to the operation of the Senate.

The duties and scope of competence of the Senate are specified in the Organizational and Operational Statutes of the University.

Another advisory body is the Council of Masters, a group of renowned experts for strategic decisions making.

1.4. University research and education

Research: Lots of tenders were performed for EU projects, but not yet any winner options in logistics.

Education: “Inspired by creativity”, as the motto of Metropolitan de-claims. The art of creative education is the core value of the University, embodied in the teaching methods and in students’ attitude, as it unfolds the way to the future success of the students. The main focus of the educational system for the Budapest Metropolitan University is on the qualified staff offered to students. In fact, in addition to renowned academics, top business professionals are also recruited to the lecturing

teams. All the Bachelor and Master degrees granted by Hungarian higher education institutions are recognized in all EU countries.

Metropolitan is among the best institutions in improving career opportunities and in facilitating the employment of students through its extensive relations with the labor market.

By expanding its international relations, the main objective of Metropolitan is to raise the standard of education, broaden its educational spectrum with internationally acclaimed programs and deepen academic and professional cooperation. Furthermore, the University also encourages students to take part in international competitions and debates.

The Metropolitan offers the following courses:

- Preparatory Programs for Bachelor studies (e.g., **Professional Foundation Semester for Business Programs**: preparatory program to further improve skills and knowledge in the field of business, economics and mathematics) and Masters (designed to prepare international students for studying at postgraduate level in the field of Communication or Business)
- Programs in English, with subjects related to the logistic sector:
 - Bachelor: Business Administration and Management, Finance and Accounting
 - Master: Business Development

Section 2: Parties involved in the Knowledge Triangle

Education: Budapest Metropolitan University

Research: N/A (not available)

Companies: TATA, ERSTE Bank, ITCB (Institute for Training and Consulting in Banking), FHB Bank

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

In the Budapest Metropolitan University, the “dual” educational system is applied for bachelor students; this system includes Universities and companies. The students who enter any of the Universities which are members of the “dual educational system”, at the same time have to

be granted by any company who is member of the system. When the student is accepted by both parties, he/she will sign a working contract with the company until the graduation, in addition to the enrollment with the University. Then, the student curriculum is adjusted by company/university and accepted by both. During the academic semesters, the student visits the lectures and seminars as any other students, while when the semesters finish, he/she works at the company. This lasts for all the bachelor study period, 3/3,5 years. During the whole period the company should give at least the minimum weekly salary to the student, which is 15% of the official Hungarian minimum salary. This salary is tax free for both, companies and students. When the diploma thesis is successfully defended, the working contract is intended to be over since there is no obligation for the companies to employ these students. From the analysis of the real experiences of Metropolitan students, there is a positive trend for employments in such companies at the end of the period, for it is strategic for the company to keep the specialized students who have been working in its departments for such a long time.

3.2. Specific Education Initiatives

- Dual systems with companies
- Coaching, training and job-seeking services
- International Scholarships: Erasmus+, Campus Mundi, Placement International, Scholarship Foundation of the Republic of Austria, Joint Research Center (JRC), MNB Scholarship of Excellence, Ceepus Freemover Mobility Scholarship
- Employment opportunities

3.3. Strategies and Support Systems for the Knowledge Triangle

- Career Centre dedicated to students
- International and national scholarship opportunities
- Student Union working actively for student employment opportunities

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

No particular extensive university-research-industry partnerships are established.

4.2. Strategic cooperation agreements with industry

No particular strategic cooperation agreements with industry are established.

Section 5: Main Challenges, Key Success and Enabling Factors

The key factor is the curriculum adjustments between company/University. For the success, the well balanced workload of the students (as they are doing exams and working at the same time) is critical: the companies would like to have good results from the exams but at the same time - availability at the work place as well.

Section 6: Future Developments and Transferability

The transferability is possible everywhere but it will be helped out with the intervention of each country's Government.

Section 7: Lessons Learnt and Recommendations

The marketing of this system was very poor from the state side. Not so many companies know about this possibility. Most of the University knows about it, but they have to do the marketing and looking for companies. As far as the companies understand the program, they are happy to participate.

Section 8: Contacts and References

Antoni Alfonz, Head of Logistics specialization at Metropolitan University Budapest
email: aantoni@t-online.hu.

Budapest Metropolitan University website: <http://www.metropolitan.hu/en/>.

5.10. *University of Padova, ITALY*

Section 1: Introduction

1.1. National and Regional Framework/Context

School of Engineering is one of the structures of the University of Padova that specifically deals with the logistics profession education.

The other structure presented is the Department of Management and Engineering. The Department is involved in the teaching programme of the School of Engineering and the master degree programmes in engineering and management, product innovation, and mechatronics. It also hosts two PhD programmes (engineering and management, and mechanical design and mechatronics).

As part of the University, it is a public structure and one of Italy's largest, with over 11000 registered students (about 20% of the whole admission number of students of the University of Padova) and about 3000 new students every year, and represents a point of reference for the higher education of the whole Italian Region of Veneto.

1.2. University Establishment

Università di Padova was established in 1222 and is considered one of the most ancient universities of the world. Università di Padova is one of the founding members of CINECA, consortium between 70 universities, and part of the Coimbra Group, association of long-established European multidisciplinary universities of high international standard.

CINECA was created in 1967 and the Coimbra Group was founded in 1985.

In 1990, the Institute of Engineering Management was founded, and was temporarily located in Monte Berico where a group of faculty members and researchers set to work. The Department of Management and Engineering (Dipartimento di Tecnica e Gestione dei Sistemi Industriali), instituted a few years later in 1998, transferred to its present location in San Nicola complex in the spring of 1999. In 1990 the first Italian five-year university course of Engineering Management

was set up to be followed in 1992 by bachelor's degree (three-year) programmes in Mechanical Engineering and Electronic Engineering, and finally in 1994 by Biomedical Engineering. In 2001 bachelor's degree programmes in Engineering Management, Mechanical Engineering, and in Electronic Engineering were instituted, and in 2004 a master degree programme (a two-year course of studies leading to a second level degree) in Engineering and Management, and a bachelor degree programme in Mechatronic Engineering were established. In 2008 courses of studies in Mechanics and Mechatronics were joined to create a new bachelor degree programme in Mechanical Engineering and master degree programmes in Product Innovation Engineering and Mechatronic Engineering were instituted.

The School of Engineering, which is entitled to coordinate all the courses referring to the logistic profession, was founded in 1876 and represent a leading institution in terms of teaching and research quality.

1.3. Organizational structure and Governance

The University of Padova structure presents the following figures:

- Rector, Deputy Rector and Vice Rectors at the Headquarters
- Academic Senate composed of the Rector, Deans of Departments, Professors, Researchers, Staff and students representatives
- Board of Administration composed of the Rector, Academic, External and Students representatives
- Management, with a general manager

The University is organized in Departments that manage directly all the educational activities and that are clustered in Schools, which coordinate, design and disseminate information about the courses presented by each Department. Also, specific Centers are included in the University (such as University Centres, Interdepartmental Centres, Research Organisations, Science and Technology Centres) with specific competences in terms of education, research and dissemination of different topics.

1.4. University research and education

RESEARCH: The University of Padova collaborates with many national and international research organizations, working to foster the growth of knowledge and manage common projects. Furthermore, it founded or is a fundamental member of the Science and Technology Centres, such as Consortium RFX, an interdisciplinary research centre involving industries and other bodies, which include the University of Padova, ENEA, CNR, National Institute of Nuclear Physics, and Acciaierie Venete steel producers; Galileo Science and Technology Park, a consortium of local agencies, Chambers of Commerce, Universities and other organizations providing companies with services typified by innovation, technological development and creativity. The School of Engineering itself, moreover, focuses a great part of its activities on research activities and projects letting the students develop a personal project during the different study courses together with research centers and companies.

EDUCATION: The School of Engineering is member of the T.I.M.E. network, gathering 54 of the world's leading Technical Universities and Engineering Schools, and offers over 30 B.Sc., M.Sc. and Ph.D. degree programmes, in the areas of Architectural, Civil, Environmental, Industrial and Information Engineering.

Recognizing that manufacturing companies nowadays need highly qualified professionals with cross sectional competences linked with the design and management of the industrial plant, students are engaged in high quality research projects related to the modeling and design of complex logistic systems, such as integrated supply chains, distribution networks and flexible and integrated manufacturing systems.

Education activities concerns supply chain operations and modeling, logistics strategy, distribution network design and optimization, product packaging design and testing, transport and person/asset info-mobility management, industrial plants maintenance, reliability analysis of machines/equipment and reverse logistics.

These research topics are strategic in nowadays industrial environments, characterized by highly customized products (the ones that can

survive in Italy) and time-oriented production systems, which need to respond quickly and efficiently to market demand, variables strongly affected by logistic choices (i.e. the way components, sub-assemblies and products are supplied and delivered, outsourcing decision vs. internalization, service operations and transportation modalities).

Section 2: Parties involved in the Knowledge Triangle

1. **Education:** University of Padova
2. **Research:** T.I.M.E. network, Bilateral agreements with USA., China (CSC), India and Brazil (Science without Borders)
3. **Companies:** local companies and laboratories

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

The main leading criteria in designing the course are:

- Programmes constantly updated, in order to meet the ever-changing needs of the contemporary world, and a qualification from the University of Padova means having achieved an ambitious objective, recognised and valued in the labour market.
- High quality research projects
- International mobility
- Interdisciplinary learning path
- Accessibility: most of the courses are taught in English

According to a recent national survey on graduates' employment, the graduated engineers can find a job within 3 months after completing their studies.

3.2. Specific Education Initiatives

All branches of engineering are covered: Industrial, Information, Civil & Environmental and organized as described below:

- 12 first-cycle degree programs (Bachelor degrees) – 3 years
- 18 second-cycle degree programs (Master degrees) – 2 years

- 1 single-cycle degree program – 5 years
- 8 Ph.D. schools – 3 years

The courses are presented in two different campuses (one in Padova and the other in Vicenza) and are managed by the Engineering Departments. In particular, the four Departments are:

- Industrial Engineering (DII)
- Information Engineering (DEI)
- Civil, Architectural and Environmental Engineering (ICEA)
- Engineering and Management (DTG))

Virtually all course units in the Bachelor degree programs are taught in Italian, while two Master degree programs are taught entirely in English and several Master degree course units are taught in English. Typically, 6-month stay in the foreign Institution to take exams or carry out the final thesis in the hosting institution.

All degree programs are strongly involved in student international mobility programs such as Erasmus Plus and TIME (Top Industrial Managers for Europe) programs. Regarding this last program, students, chosen from amongst the best in their respective Universities, study for a total of between five and six years and are awarded two Masters-level Degrees from two different countries at the end of their study. Through its double degree activities, T.I.M.E. promotes high-quality engineering education and produces graduates who are able to work transnationally and in trans-cultural environments. For its students, T.I.M.E. develops qualities of (intellectual and physical) mobility, adaptability, openness and awareness of other cultures and realities, as well as giving an in-depth engineering education.

For its member institutions, T.I.M.E. encourages and promotes mutual academic recognition, provides opportunities for benchmarking and actively develops quality in higher education.

For employers, T.I.M.E. offers European engineers and managers trained to the highest level, adaptable, mobile, bi-cultural and bilingual.

3.3. Strategies and Support Systems for the Knowledge Triangle

The University of Padova works to develop and/or to be part of the main regional, national, European projects and initiatives in several areas, including the industrial one.

In the University and in each Department, the “Servizio Stage e Career Service” office is entitled to help students to find the perfect match with an Italian/local company for their working experience during the study courses. Moreover, the same office offers contact references for Job Placement after students’ graduation in order to improve the efficiency of the connection with the labour market and the industry.

The Departments are constantly keeping contacts and open projects for students, researchers and professors with the major local companies and scientific laboratories, in order to work together in building the best qualified professionals to put in the labour market.

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

- ERASMUS + project, the main project for the support of students’ mobility throughout Europe during and after the university course in the University of Padova.
- TIME network, bilateral agreement for promotion and recognition of academic excellence and relevance to the international labour market
- EAIE Expert Network on Joint Programmes, network that brings forward issues regarding the possible incompatibilities of the national higher education structures in the development and implementation of joint programmes and provides a forum for identifying best practices and support, including joint and multiple degrees.

4.2. Strategic cooperation agreements with industry

- *Tempus project*: Development of Career Guidance aimed at improving Higher Education in Serbia. Program focused on development of career guidance in higher education as an integral part of development of system of career guidance in Serbia. Specific objectives of project are: Development of Program of Ca-

reer Information, Guidance and Education aiming to increase youth employability, Enabling wider accessibility and variety of programs in Career guidance at Higher Education Institutions, Raising the level of recognizing importance of Career Guidance by the policy makers and other stake holders and Development of Career Guidance Programme for Youth and Methodology for CGC centres at Serbian HE institutions.

- *Partnership with leading companies*, such as PwC, Ferrovie dello Stato, Deloitte, KPMG, several Banks for the activation of internships and/ or collaborations for research programs.

Section 5: Main Challenges, Key Success and Enabling Factors

The public structure of the University can be considered as an enabling factor for it representing a relevant actor of the whole Region in terms of education offer. On the contrary, this aspect can put some limitations in terms of acquisition of funds for specific projects since the scope of public entities is sometimes limited.

Key successes are represented by the high level of collaboration between structures, the common culture that is shared in the design, development and evaluation of the educational offer and the research initiatives, and the focus on continuous improvement.

Section 6: Future Developments and Transferability

The format of the University of Padova should be transferred to other European realities, considered that the real power of the experience is based on collaborations and partnerships in addition to a deep attention to contents, study methods and constant improvement. In the future, the scope is to widen the actual offer with a variety of courses, expand the number of reached students and enhance the level of students' occupation after graduation. For research, the mission is to expand the long-term collaboration with research centers and companies, in order to maintain the competitiveness and the effectiveness of the educational offer.

Section 7: Lessons Learnt and Recommendations

The main lesson learnt from the analysis of the University of Padova experience is that the constant investments and focus on the development of new educational solutions and offers is the basic element for the innovation. Also, the strict bond between other European Universities, thanks to bilateral agreements and voluntary networks, enables strategic and innovative research programmes and exchanges of students from different countries that are a key point for the creation of virtuous cycles in terms of education, value creation and dissemination of best practices.

Section 8: Contacts and References

University of Padova website: <http://www.unipd.it/en/>

School of Engineering website: <http://www.ingegneria.unipd.it/en/>

5.11. University of Gothenburg, SWEDEN

Section 1: Introduction

1.1. National and Regional Framework/Context

Within the EU alone, the freight transport and logistics sector employs 6 million people and has an added value of some €15 billion. Freight transport and logistics influences virtually all industrial and public sector activities and affects every citizen's daily life.

The freight transport and logistics discipline is increasingly recognized as pivotal to sound decision making and organizational success in meeting business objectives. The globalization of production and consumption has led to a situation where logistics decision makers must constantly strive to deal with the complex challenges associated with internationally distributed production, trade and transport networks. In order to ensure and maintain both, profitability and competitiveness, organizations need to constantly review their logistical requirements to be able to adapt to potentially volatile changes in customer demand and technological developments. The environmental imperative has introduced a whole new and, from a societal perspective, vitally important dynamic into the logistics and freight transport arena.

Gothenburg is the second largest city in Sweden. It is situated on the west coast and has a population of 520 000 in the actual city and 940 000 in the larger Gothenburg area.

Gothenburg was founded in 1621 by King Gustavus Adolphus. The objective was to open up a window to the rest of the world. The city has developed considerably since then. In fact, from having been a traditional port and industrial city, Gothenburg has evolved into an exciting and modern centre for creativity and innovation. Today the city is a strong knowledge and information hub with a strong presence of its research-intensive pharmaceutical and automotive industries, as well as higher education, IT and media production. The city's businesses include a number of international success stories within the fields of marketing, architecture, web design and special effects in film production. Moreover, several Gothenburg-based brands have attracted a lot of attention in the fashion world in recent years.

This high level of creativity and innovation is of course represented at the University of Gothenburg. The University shares an IT faculty with Chalmers University of Technology, the Sahlgrenska Academy carries out medical and health-related research and education of the highest possible quality, and the University offers strong educational research as well as outstanding research and education in the field of media. The same can be said about business, economics and marketing, film, design and fashion, and a number of other areas.

The coastal landscape and the nearby sea are very important to the University of Gothenburg and the city of Gothenburg. The city's trams provide direct access to the coastline, and once there, there is a large ferry system servicing the beautiful archipelago – a spectacular seascape consisting of about 10000 granite islands carved out during the last Ice Age. The proximity to the water has been important to the University of Gothenburg, which has a strong marine profile and is home to about 80 percent of the country's marine research.

1.2. University Establishment

The University of Gothenburg was established in 1891 with the help of private donations. In 1907 it became an independent university college

with the same status as the two national universities of Uppsala and Lund. It was therefore formally founded in 1954 through the amalgamation of this college with the medical college, which had been established in 1949.

During the 1950s and 60s, the University expanded rapidly, moving from 500 students in the late 1940s to approximately 21000 in the late 1960s. Today, University of Gothenburg has about 37000 students, and almost 6000 employees. There are 38 departments in all, many of which rent facilities in old stone buildings and other properties in the centre of town. Several new university buildings have increased its “centralisation”, and most of the departments are now located in the city centre. This has made the University of Gothenburg a truly urban university.

1.3. Organizational structure and Governance

The University Board is the University’s highest decision-making body; and the Vice-Chancellor of the University is the Head of the University. The University is made up of a number of University-wide staff positions, units and bodies that support the University Management and the organisation in different matters. The University’s core activities, i.e. research and education, are organised and run by the University’s eight faculties, which comprise 38 departments, as well as by the University’s Centres of Expertise and Research, which are approximately thirty in number.

1.4. University research and education

The broad-ranging research at the University of Gothenburg is innovative, characterised by multidisciplinary cooperation, closely linked to education and stands in close contact with society. Its 2700 researchers, teachers and doctoral students span from developmental biology and gender studies to logistics and marine mammals.

Strong research and interesting study programmes attract scientists and students from all around the world. The University of Gothenburg is environmentally certified and works actively for sustainable development. With new knowledge and new perspectives, the University of Gothenburg contributes to a better future.

Section 2: Parties involved in the Knowledge Triangle

The University of Gothenburg is an open university involved in a constant flow of knowledge, education and ideas with the rest of society, both nationally and internationally. It therefore connects research and professional sector through a series of well-established programs.

It is the only Swedish institution that has centres for research and education focusing on all regions of the world and participates in about 2300 collaborative projects.

Its connection with the research sector is strong, in fact the University of Gothenburg claims its role as institution enabled to connect companies that need expert support to handle organisational changes, staff training. Moreover it aims at connecting public authorities that may need help with independent studies and analyses.

The University of Gothenburg is involved in a series of different strategies aimed at developing a strong and active collaboration between academia, business and the public sector: contract research, professional development, expert consulting and external employment of doctoral students.

Contract research is a good way, for any company in need of an assessment, to get problems and issues scientifically analyzed and developed; concerning professional development, **contract education** is a good way for businesses and organizations to strengthen the competence of their staff. The training is customized to the needs of the business/organization. It can be offered as a course, a series of seminars or in any custom-made format; **expert consulting** is a way for a client to use a scientist's knowledge to solve a problem. In contrast to contract research, expert consulting relies primarily on already existing knowledge and techniques, and is not intended to produce new research results; the **employment of doctoral students** helps a business or organization to gain access to the latest research through close cooperation with the University. The businesses or organizations can run a development project for new products, services and applications.

The University of Gothenburg also promotes the creation and management of Centers of Expertise and Research. These institutions serve as a meeting point for students and researchers, as well as represent-

atives from the commercial, industrial and public sectors. Centres of expertise and research are cross-disciplinary and may include several academic subjects, faculty areas and higher education institutions.

The purpose of these centers is to manage areas and topics of interest that by nature span across several academic disciplines. There are approximately 30 centers of expertise and research at the University of Gothenburg. There are also other collaboration and networking groups.

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

The main drivers of the University of Gothenburg's education model are clearly deductible by its choices towards the world outside the academia. The model is based on the strong partnership with the production sector – i.e. new and old companies at a national level - and the tradition-in-practice of the competences gathered in the research sector.

The alliance between the three poles of the knowledge triangle creates an actual partnership between these three groups of actors that is virtuous for all of them in different ways. The University is called by society to connect the theoretical knowledge to actual problems and to train professionals to face new challenges. On its behalf, the research sector is called to focus on actual problems and to be updated with the changing issues and necessities of nowadays society.

At the University of Gothenburg there are more than 50 different research groups put together to conduct high quality and often multi-disciplinary research and for cooperation with society.

3.2. Specific Education Initiatives

The course of study that has more chances to connect the University with both, the productive and the research sectors, is without any doubt that of doctoral studies. Doctoral studies can be the start of an academic career as a researcher, but is also a high-quality education for those who want to pursue a career outside academia.

A doctoral degree is a proof of knowledge within an area and of training in scholarly thinking. That makes researchers specifically quali-

fied as experts and consultants, but also as officers with responsibility to investigate and prepare complex questions.

A researcher can also work with dialogue in contexts where research results have significant meaning, for instance in political matters.

Moreover, the University of Gothenburg has a master course exchange with Chalmers – University of Technology that both strengthens the connection between the research sector and the productive sector. The connection between the two Universities creates a partnership between academic research, applied research and the needs of the productive sector.

Master of Science in Logistics and Transport Management

http://utbildning.gu.se/education/courses-and-programmes/program_detail/?programid=S2LOG

The M.Sc. in Logistics and Transport Management prepares students for truly multifaceted challenges, requiring a balance between theoretical and practical skills. The programme provides an intellectually stimulating environment, within which students develop their skills in critical thinking and analysis, as well as improving knowledge of, and strategic perspective on, the relationships, flows, chains, processes and systems that pervade the international freight transport and logistics arena. Students analyze problems, both theoretical and real-life, and design solutions for organizations operating under uncertainty and facing complex and rapidly changing markets and technologies.

In pursuing this programme, students benefit from University of Gothenburg's strong research and educational links with the logistics industry locally, nationally and globally. Significant emphasis is placed on the use of state-of-the-art logistical software, as well as real world examples and case studies, some of which are implemented in close co-operation with established businesses from the logistics community. Furthermore, the core logistics faculty is supplemented by prestigious international visiting professors and representatives of the business community. The programme also provides opportunities for field work in an international environment at respected universities in Europe and overseas.

Graduates from the M.Sc. in Logistics and Transport Management programme are employed as purchasers, logistics consultants, supply planners, shipping coordinators, freight forwarders, chartering agents, shipbrokers and supply chain managers. The programme comprises 60 credits of core courses, 30 credits of elective courses and a further 30 credits related to the Master's thesis.

Course in Logistics Supply and Demand Chain Management

The course presents the mission, business processes, and strategies needed to achieve integrated logistics management in what is referred to as supply chains, demand chains or value added chains. The course deals with vertical systems of actors, activities and resources involved in the process of making goods and services available for use or consumption. This is the inter-organizational and organizational setting for logistics and transport.

Other correlated courses:

- Sustainable Logistics
- Integrated Logistics
- Logistics System Simulation
- Transport and Logistics Law

3.3. Strategies and Support Systems for the Knowledge Triangle

The whole University of Gothenburg is oriented at creating and using knowledge with the specific intent of connecting the University itself to the research sector and the productive needs of the society. Therefore, it represents a very good example of the implementation of the knowledge triangle in every sector.

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

The University of Gothenburg has a deep interconnection with the industry sector and has activated around 50 different research schools that connect the University with both, the research and production sectors.

The more relevant include:

- **Biosum**, an interdisciplinary research school established in 2008 by University of Gothenburg and Chalmers Technical

University in collaboration with Regional West Sweden development agency (VGR);

- ***The National Research School in Genomics and Bioinformatics***, which is governmentally supported and hosted by Göteborg University with partners at Chalmers University of Technology, Halmstad University, Lund University and Skövde University.

Its overall aim is to play the role of a strong force in south-western Sweden for research and education in the field of Genomics and Bioinformatics, and in that process strengthen the links between the collaborating universities at all possible levels.

- The graduate school Environment and Health which studies the relationship between human health and the environment from a number of different perspectives.

4.2. Strategic cooperation agreements with industry

The University of Gothenburg is an open university involved in a constant flow of knowledge, education and ideas with the rest of society. The researchers and students help with the development of new businesses. The collaboration between the University and the productive sector aims at the growth and development of the society.

Section 5: Main Challenges, Key Success and Enabling Factors

Four basic principles guide the University of Gothenburg: its research, education and cooperation is characterised by a quest for high quality. Its standpoints and decisions are based on a clear responsibility for the development of society. Its work is guided by a global engagement that constantly reminds about the role of education in the development of a better society.

Section 6: Future Developments and Transferability

In 2020, the University of Gothenburg is planning to achieve an even more innovative and multidisciplinary research based on strong individual disciplines. All education is research based; as part of their stud-

ies, University of Gotheburg's students are put in contact with active researchers and highly advanced research. The quality of its research and education is strengthened through close contacts with the productive sector, mainly the local and regional one.

Education and research are the University of Gothenburg's most important contributions to sustainable development, and the University aims to become a European leader in the area.

In 2020, researchers from the University of Gothenburg in various disciplines are planning to contribute to solutions of both, regional and global problems. Their programme catalogue is very broad, reflecting not only the needs of students and the surrounding world but also the responsibility for lifelong learning and promoting the general level of knowledge in society. They are engaged in close cooperation with the surrounding society, work for sustainable development and are an active and appreciated provider of knowledge.

In 2020, the research at the University of Gothenburg is expected to be characterised by global perspectives and will attract even more leading researchers from around the world. All programmes offer international outlooks and student exchange opportunities. Highly advanced programmes attract students from all over the world. The University is a prioritised cooperation partner in international initiatives.

Section 7: Lessons Learnt and Recommendations

No specific lessons learnt and recommendations.

Section 8: Contacts and References

Address: Box 100, SE-405 30 Gothenburg, SWEDEN

Phone: 46 (0)31 786 10 00

The University of Gothenburg website: www.gu.se

Records Management

Phone: 46 (0)31 786 11 11

Email: registrator@gu.se

5.12. *Chalmers University of Technology, SWEDEN*

Section 1: Introduction

1.1. National and Regional Framework/Context

Chalmers has been a leading provider of research, education and innovation in the area of Production Engineering since the 1960's. It has continuously provided national and global industries with high-quality research results and engineers, supporting manufacturing companies like Volvo, SKF, SAAB, Sandvik, Ericsson and others, in their global competition.

Chalmers University is sustained by the Chalmers Foundation, the sole owner of Chalmers University of Technology AB. The foundation's purpose is to ensure that the company carries on education and research at international high level. Furthermore, it ensures that the companies' resources are used effectively and that the financial assignments which the foundation considers are of value to Chalmers.

1.2. University Establishment

Chalmers was founded in 1829. The university is named after the major benefactor, William Chalmers, one of the directors of the successful Swedish East India Company in Göteborg, Sweden.

William Chalmers (1748-1811) had created a greater wealth from his work within the Swedish East India Company during the late 1700's. Influenced by Pehr Dubb, he then bequeathed all his estate to the Sahlgrenska Hospital in Gothenburg and to the creation of an industry school for poor children who learned to read and write. "Chalmersska Slöjdeskolan", which opened in Gothenburg, November 5, 1829, and became the beginning of Chalmers University of Technology.

The first president was the industrialist Carl Palmstedt. The connections with industry and commerce have therefore been natural from the very beginning.

Chalmers is the only university in Sweden, which is named after a person. The emblem Avancez, together with the logo, forms the university brand. The emblem has its origin in the donor William Chalmers seal.

1.3. Organizational structure and Governance

Chalmers University of Technology is a foundation university with the board of the Chalmers University of Technology Foundation as its supreme decision-making body. It is responsible for the overall planning, co-ordination and follow-up of the university's activities. Under the university board, the President and CEO is responsible for operations generally.

The President and Vice Presidents

The President and the Office of the President represent Chalmers in its dealings with the Swedish government offices and with other external organisations. They work with the overall strategy to advance the university and to coordinate and monitor its operations.

Departments and Research Groups

Teaching and research is carried out by Chalmers' 18 departments. The departments are led by a Head of department, and are made up of research groups and divisions.

Centres

At Chalmers, there are six national competence centres financed by Vinnova and the Swedish Energy Agency. There are also a number of centres cooperating across traditional departmental boundaries.

Chalmers Operations Support

Chalmers Operations Support has 10 departments: Chancellery, HR Department, IT Office, Programme- and Project Management office, Communications and Marketing, Planning Analysis and Economics, Service Department, Innovationskontoret, Operative and Strategic Support and Student and Education office.

The Chalmers Group

Included in the Chalmers University of Technology group are the subsidiary companies Chalmers Professional Education AB and Chalmers Ventures AB. Chalmers University of Technology is also a partner in the technology parks Lindholmen Science Park, Johanneberg Science Park and Sahlgrenska Science Park, as well as in AstaZero and the IT University. Chalmers Industrial Technology (CIT) is controlled by Chalmers University of Technology.

1.4. University research and education

Chalmers is rich of research infrastructures, strongly connected with the productive sector and creating a link with the applied research sector.

Supply Chain Management Programme

The programme focuses on the design, management and improvement of supply chain management strategies. It is multidisciplinary and builds on several scientific disciplines.

One important way a company can improve its competitiveness is to apply supply chain management (SCM). This programme helps students develop their skills in purchasing, logistics, marketing, transport and general management.

The courses and master's theses include different pedagogical ideas and teaching methods in order to fulfill the aim and learning objectives.

Problem-based learning, including case studies and problem solving with quantitative and qualitative models, is one important aspect of the programme.

More information about the Supply Chain Management programme can be found at:

http://www.chalmers.se/en/education/programmes/masters-info/Documents/Supply_Chain_Management.pdf.

Efficient and Green Supply Chains - Postdoc positions

The supply chains of today, including the transport systems, need to be developed in order to increase efficiency, fulfill their purposes and reach the sustainability goals. In order to obtain sustainable supply chains, it is necessary to adapt for instance sourcing, logistical structures and activities including management of transport operations, planning and control of product flows, and product end-of-life and recovery processes, also referred to as a closed loop supply chain. How various stakeholders, individually and collectively, can act to improve sustainability of supply chains, is the common denominator of Chalmers' research. Chalmers recruits several postdocs to address these and other sustainability challenges from different perspectives.

Chalmers Centre for Computational Science and Engineering (C3SE)

Chalmers Centre for Computational Science and Engineering (C3SE) is Chalmers' infrastructure for demanding computing calculations and data storage. It provides researchers at Chalmers University of Technology, University of Gothenburg and in the rest of Sweden, with hardware resources as well as software and knowledge of numerical modelling, simulation and analysis. The facility is one of the nodes of the Swedish supercomputer Swedish National Infrastructure for Computing (SNIC).

Chalmers Mass Spectrometry Infrastructure (CMSI)

Chalmers Mass Spectrometry Infrastructure (CMSI) is a Chalmers infrastructure that provides access to mass spectrometry analyses to researchers both within and outside Chalmers.

Mass spectrometry is an analytical technique that can be used to measure both, the amount (quantification) and structure of molecules. In research, mass spectrometry has many different applications, from analysing metals in food samples, confirming the structure of newly synthesized molecules, or measuring metabolites in blood.

The CMSI is mainly focused on measuring small molecules (<1000 Da) in biological samples, and measuring the molecular weight to identify synthesized chemicals. The instruments at CMSI give biology and chemistry researchers access to state-of-the-art methods with which to carry out their research, and the ability to stay at the forefront of their research fields.

Chalmers Power Central

Chalmers Power central is an advanced energy research facility based at the Johanneberg campus. Cutting edge research in combustion and gasification of biomass is carried out there in a large-scale research boiler along with flaming combustion and carbon capture. The Power central also supplies the campus with electricity, heating, cooling and compressed air.

The Power central attracts users from around the world. In the open collaboration concerning this unique facility, researchers, industry and the public sector are engaged in efforts to contribute to a sustainable,

climate-neutral future. Based on thorough intelligence analysis, operations are steered towards the most relevant research questions and the equipment is being continuously updated accordingly.

The Power central is a joint project between Akademiska Hus (property company), Chalmers and Göteborg Energi (utility company). The Division of Energy Engineering at Chalmers is coordinating the trials in the research boiler. The resource is open to all researchers at Chalmers after they have undergone a safety course and been granted access by Akademiska Hus.

Chalmers Materials Analysis Laboratory

The Materials Analysis Laboratory uses high quality instruments – bass instruments, as well as world leading cutting-edge instruments – to analyse a wide range of materials. The purpose of the laboratory is to provide access to advanced experimental methods for materials research, both for Chalmers researchers, as well as researchers from other universities and industry.

The base for the laboratory is a collection of instruments of various types of high-resolution, world-class electron microscopes, known as atom probes and equipment to prepare samples prior to electron microscopy. There is also equipment for optical spectroscopy, surface analysis and chemical characterisation.

Chalmers Simulator Centre

The Lindholmen campus has the most comprehensive simulation equipment for training and research in maritime operations. There are a number of different simulators representing different parts of a vessel and functions on shore. Several of the simulators are connected together which makes it possible to simulate complex scenarios, such as entire shipping lanes with several operators involved.

For training courses, the Simulation Centre is used for training aspiring marine officers in advanced operations, including preventing and mitigating the consequences of accidents at sea. The simulators are also used in the training of professional active marine officers.

The simulation centre is linked to the Lighthouse maritime competence centre and is used in domestic and international research projects

with participants from academia, maritime authorities and maritime industries. The simulators also serve as test platforms for a range of projects, such as the evaluation of newly developed e-navigation services.

HSB Living Lab

HSB Living Lab is a research and collaboration project between Chalmers, Johanneberg Science Park and HSB. As well as providing residential accommodation, the building will serve as a laboratory for the researchers – a living laboratory. This provides a great opportunity to conduct research into sustainable innovations in real-life residential environments. Measurements will be collected through sensors in the building, where water recycling, a solar panelling solution, smart booking systems, electricity consumption and sustainable building materials and components will be tested and evaluated. The construction started in September 2015.

Nanofabrication Laboratory

The Nanofabrication Laboratory is a clean room facility for research and development in micro and nanotechnology. A wide range of equipment for developing and testing new ideas on a micro and nano scale could be found there.

The Nanofabrication Laboratory is part of the national research infrastructure Myfab, and is the national node for nanolithography, which is a method for producing patterns in the nanometer scale. Chalmers' expertise and extensive experience in nanolithography forms the basis for two strategic areas in which microwave electronics and photonics is one, while quantum components is the other. A complete laboratory fitted out to perform all the steps from material growth to components and circuits is available.

The laboratory is open to both, internal and external academic and commercial stakeholders. There is staff who trains new users, even those with no prior knowledge, to use the equipment and manufacturing methods. The staff can also perform commissions for customers who lack their own staff or the opportunity to work in a clean room.

Onsala Space Observatory

The Onsala Space Observatory is a national facility for radio astronomy operated by Chalmers on behalf of the Swedish Research Council. The facility is located on the Onsala peninsula, 45 km south of Gothenburg.

The area is home to a 25-metre radio telescope, and a 20-metre radio telescope for millimetre waves and the Swedish station in the European radio telescope Lofar. Onsala Space Observatory is also involved in the development of instruments for shorter wavelengths, such as for the Sest telescopes and Apex in the Andes in South America. The observatory is also involved in international projects such as the European VLBI Network, Alma, Lofar, SKA and Herschel Telescope.

Techniques developed for radio astronomy are also well suited for observations of the Earth and its atmosphere. Research at the observatory therefore also deals with the measurement of the Earth, navigation and remote analysis. A new instrument – the Onsala twin telescope – is in the process of being acquired to accurately determine continental drift.

Revere – Chalmers Resource for Vehicle Research

Revere is a new laboratory focused on automotive-related research. Main research areas are self-driving vehicles, active safety and vehicle dynamics. In the lab, there are several vehicles which can be fitted with different types of sensors, equipment for data logging, communication technology and more. This allows the lab to provide a research platform for development and verification of theoretical models, algorithms and technologies using real vehicles in real traffic environments. Tests in different traffic environments are carried out in close cooperation with the test track AstaZero, where Chalmers is a partner.

There is also an explicit aim to promote research between different scientific disciplines, and to increase collaboration between researchers from different universities and research institutes. The lab is also available for undergraduate students and companies involved in research projects. Thereby Revere is an important arena for innovation and collaboration.

The National laboratory in terahertz characterisation

The National laboratory in terahertz characterisation is a new, unique laboratory for the development of technology in the hard to reach terahertz frequency range, i.e. frequencies of the order of a trillion cycles per second. The Terahertz range is attractive and offers applications including space exploration, future wireless communications and radar sensors, for example for a self-propelled vehicle fleet.

The vision is to become one of the three most complete and advanced measurement laboratories for high frequencies, open to users from all around the world. A new generation of instruments allows measurements at frequencies up to and above one terahertz. The equipment is adapted to suit multiple research areas: materials, components, circuits, systems, and antennas for high frequencies.

The National laboratory in terahertz characterisation is brand new and will start operations in the spring of 2015. The laboratory is heavily linked to undergraduate education at Chalmers and will educate and train new users continuously in measurement technology.

Section 2: Parties involved in the Knowledge Triangle

Chalmers Production is a platform for research in manufacturing, production systems and product development with sustainability and future smart factories as common challenges. Chalmers' philosophy is to influence early in the development process where many small improvements make great benefits in the end.

The Production Area of Advance congregates more than half of all Chalmers departments, five research centres and three other closely linked research environments, 25 research groups and a network of collaborating industries. Chalmers' research is fundamentally based on science in mathematics, physics and/or chemistry.

Currently over 200 researchers are involved in Chalmers Production Area of Advance and they represent the following departments:

- Civil and Environmental Engineering
- Energy and Environment
- Chemistry and Chemical Engineering
- Materials and Manufacturing Technology

- Microtechnology and Nanoscience
- Signals and Systems
- Product and Production Development
- Technology Management and Economics
- Applied Mechanics

Section 3: Integration of Education in the Knowledge Triangle

3.1. Drivers of the Education Model

The Areas of Advance are organised as strong, challenge driven thematic platforms for strategy and long-term collaboration that hunt down specific challenges, often directly relevant for industry and society. They also offer common access to cutting-edge research infrastructures as well as to several targeted centres. At the same time, the departments represent a continuous source of expertise. And that is, the interplay between the departments and the Areas of Advance that is so instrumental to their success, mobilizing all aspects of Chalmers's operations.

3.2. Specific Education Initiatives

Initiative Seminars at Chalmers represent crucial meeting places for people representing research, innovation and society. The seminars address challenging questions for humanity, important for a sustainable future. Renowned scientists are invited to talk about their work, discuss and in other ways interact with scientists and students at Chalmers. Representatives from industry and society are engaged in the program. Students are involved in workshops and poster exhibitions. An Initiative Seminar always includes a popular science component.

3.3. Strategies and Support Systems for the Knowledge Triangle

Since 2015, Chalmers' eight Areas of Advance jointly invest in a number of bold initiatives aiming at the future. The investments are focused on societal challenges within areas in which Chalmers has great potential to achieve international success.

The approaches are cross-border collaborations, high level of excellence, and integration of research, education and utilisation. The intention is that the joint initiatives will be able to give much too many.

Most of the joint Areas of Advance investments are about challenge-driven and interdisciplinary development, each of which involves several different parts of Chalmers. Through cross-border mustering of strength, they create opportunities to break new ground and eventually bring considerable benefits to society.

Section 4: Collaboration with External Partners

4.1. Extensive university-research-industry partnerships

No particular extensive university-research-industry partnerships are established.

4.2. Strategic cooperation agreements with industry

No particular strategic cooperation agreements with industry are established.

Section 5: Main Challenges, Key Success and Enabling Factors

Chalmer's vision is sustainable and innovative production, with respect to economical, ecological and social aspects — where industries, environment and members of society all benefit.

Its mission is to achieve excellence in scientific research and development — supporting sustainable and innovative production through knowledge, methods and tools.

This is realised by creating:

- Development processes for innovative and competitive product and production systems, based on a life-cycle perspective.
- Optimized production systems and manufacturing processes.
- Minimized environmental impact through reduced waste of energy and natural resources.
- Safe, healthy, and rewarding work environments.
- World-class education in sustainable production.

Section 6: Future Developments and Transferability

At Chalmers, sustainability is a central value. If there's a need to build a society that can provide 10 billion people with well-being within a few dec-

ades, it is not feasible to lock in sustainable development to such individual parts of the university as an educational programme or Department.

Instead, its stance has been to let their vision, Chalmers for a sustainable future, permeate all of their activities; from undergraduate education and doctoral programmes, research, innovation and collaboration, to campus development and internal environment. For almost thirty years, all Chalmers' students have taken a class in environment and sustainable development and had the opportunity to complete their studies with a sustainability profile. And by means of the eight Areas of Advance, all with sustainable development as a driving force, Chalmers is gathering skills and power, in collaboration with other actors in society, to tackle the large and complex societal challenges they are facing.

As a university, Chalmers has two especially important roles. First, there are few institutions in society with time perspectives as long as universities. There they have a responsibility, for example, in basic research, to train the curiosity on the unknown, possibly to find something ground-breaking that can be of crucial importance. But their most important role as a university is to build up the ability of their students, so they can gain the best position from which to handle transition over the next fifty years, when these students will be working.

The transition they are facing can be compared to the transition that took place when agricultural society developed into an industrial society. Now, industrial society needs to evolve into something much more efficient and accommodate human needs while generating significantly less environmental impact. This is where the responsibility of the university and the individual engineers lies. Partly in seeing how technology can be an enabler, but also in reflecting over societal consequences and ethical issues related to technological development in a global world.

Chalmers is a pioneer in regards to how a university can take on, work with and take responsibility for sustainable development. To maintain a high level of ambition and to be a pioneer, both courage and power are required.

Section 7: Lessons Learnt and Recommendations

Living in a world of swiftly changing conditions, trends linked to phenomena including globalisation and digitalisation are having profound effect on all of us. The great challenges society is facing requires collaboration across boundaries of many different kinds.

As a university of technology and science, Chalmers aims at producing and spread knowledge, expertise and solutions that benefit everyone: both, individuals and society. Education that prepares students for the future, research at a high international level and close, open and meticulously crafted partnerships with industry and commerce, and the public sectors, make this possible. As a university and a partner whose appeal is recognised, Chalmers can work with others to make a real difference for a sustainable future.

Section 8: Contacts and References

Phone (switchboard): +46 31 772 1000

Direct dial +46 31 772 + extension

Fax: +46 31 772 3872

Chalmers University of Technology

SE-412 96 Gothenburg, Sweden

Email: nextstop@chalmers.se

6. Analysis of the Presented Good Practices

Knowledge is now considered to be the most important asset in overcoming the social, economic and environmental challenges faced by our society today, in particular in the area of logistics and supply chain management, as it allows companies to better compete in the market, supports meeting the needs of individuals and societies, saves lives and helps counteract climate change and mitigates risks associated with it. Therefore knowledge dissemination in the field should be regarded as a main priority of every higher education system.

Stressing the imperative need of knowledge transfer in the field, one of the key activities of the current project is to develop a compendium with the aim to highlight examples of good practices addressing the interactions between parties involved in the knowledge triangle (KT) in the

field of logistics and supply chain management. Thus, this compendium provides an overview of such examples extracted from the case studies of 12 European HEIs that have applied various KT approaches. Regardless of the form in which the relevant practice is adopted, all of the investigated HEIs place particular emphasis to this topic. The compendium contains over 60 good practices related to KT. The list of the practices organized based on the main actor involved is presented in the Appendix.

The HEIs from which the good practices are derived are heterogeneous in terms of their *type, ownership, country of origin and level of influence* as presented in Table 4. The practices are predominantly collected from university's departments and units that carry out educational and research activities in the field of logistics and supply chain management (6 of them are public and 5 – private). One of the HEIs qualifies as an international center for education and research in logistics and supply chain management, which is governed by a private foundation of public initiative (Zaragoza Logistics Center – ZLC). The compendium represents good practices of HEIs from eight countries, all of them EU members (Sweden – 3, UK – 2, Italy – 2, the Netherlands, Austria, Hungary, Spain and Bulgaria – 1). The context in which the observed universities operate is different – local, national and international or combined, meaning that each of them has different level of influence on integration of knowledge triangle. Those with predominantly *local impact* have a strong professional orientation and focus on employability and support the local economic development and growth, maintaining close links with companies from the respective region.

For example, the main purpose of ZLC's creation is to actively contribute to the innovation in the Aragonese region, and in particular to develop and disseminate knowledge, supporting the companies established in PLAZA (the largest logistics park in the southwest of Europe).

The Erasmus University Rotterdam (EUR), participating in the Smart-Port joint venture³⁹, works collaboratively with other stakeholders to tackle future challenges by joining its efforts in creation, dissemination,

39. Joint venture between the Port of Rotterdam, Deltalinqs, the municipality of Rotterdam, the Erasmus University Rotterdam and Delft University of Technology

and application of port related knowledge. The approach of the University of Huddersfield (HUD) which courses in the field of logistics and supply chain management are packed with professional development opportunities, especially those that are carried out under the Novus scheme⁴⁰, is another illustrative example where the main aim is to create the “Leaders of Tomorrow”. In this regard it should be noted that one of the purposes of launching the Novus initiative was the aim to tackle shortage of skilled professionals in logistics and supply chain management in UK labour market, which has become more noticeable over the last few years. Thus, it will enable both the long term viability and sustainability of business and improved competitiveness of young people.

The HEIs with *national influence* have high socio-economic impact of the respective country. For instance, ZLC has been designated to be the lead center of the National Integrated Logistics Competence Center (CNC-LOGISTICA), established by the Spanish Ministry of Education and Science in accordance with the National R&D and innovation plan 2004-2007 in early 2006. ZLC’s responsibilities are related to defining and coordinating research, development and innovation initiatives in the field of logistics and supply chain management across Spain. ZLC has been officially recognized as a Knowledge Transfer Office (KTO) by the Spanish Ministry of Education and Science and was selected along in 2014 with 50 other entities by the Centre for the Development of Industrial Technology (CDTI – National Innovation Agency in Spain) to support the participation of Spanish companies in the Horizon 2020. Another example of national influence is the University of National and World Economy (UNWE) which is the only one in the country that offers logistics education at all three educational levels – bachelor, master and PhD. Additionally, its professionals contribute to industry and government institutions by their participation in management and expert boards, as well as in consulting vari-

40. Novus scheme is an educational initiative produced by BiS Henderson and the Chartered Institute of Logistics and Transport in sponsorship and collaboration with the Lloyd Fraser Group, Premier Foods, Unipart Logistics, the University of Huddersfield and Wincanton. The scheme is backed by industry partners in the NOVUS Trust, including a total of 30 companies from the retail sector (like ASOS, Sainsbury’s and Morrisons), manufacturing (such as PZ Cussons, Cummins and Arla) and logistics (DHL, Wincanton, CEVA).

ous projects and business endeavours. Finally, EUR’s academic community plays an integral part in setting national and international research agendas and some of its members are involved in TKI Logistics⁴¹ governance.

The HEIs that have *international influence* carry out extremely wide cross-border activities besides the common practices of science and education internationalization such as international exchange agreements, participation in international projects, etc. For instance, the successful partnership between ZLC and Massachusetts Institute of Technology (MIT) Center for Transportation and Logistics led to the creation of the MIT Global SCALE Network that now spans four continents. The SCALE Network allows faculty, researchers, students, and affiliated companies from all MIT Global SCALE centers to “pool their expertise and collaborate on projects that will create supply chain and logistic innovations with global applications, and help companies to compete in an increasingly complex business environment”⁴².

Name of the HEI (acronym used in the study)	Type of HEI involved	International/ National/Regional Context	Country
Zaragoza Logistics Center (ZLC)	International center for education and research in Logistics and SCM Private foundation of public initiative	Regional National International	Spain
Rotterdam School of Management (RSM), Erasmus University (EUR)	Public University	National International	The Netherlands

41. Triple helix Top Consortia for Knowledge and Innovation (Topconsortium voor Kennis en Innovatie – TKIs) in which the government, industry and academia in these sectors work together to draw up research and innovation roadmaps and to implement research projects to realize the Top Sector ambitions.

42. The MIT Global Supply Chain and Logistics Excellence (SCALE) Network: <http://scale.mit.edu/centers>.

The University of Huddersfield (HUD)	Public University	Regional	UK
University of National and World Economy (UNWE)	Public University	National	Bulgaria
Montanuniversitaet Leoben (MUL)	Public University	Regional	Austria
Hull University Business School (HUBS)	Public University	National International	UK
Jönköping University (JU)	Private University	Regional	Sweden
Politecnico di Milano School of Management (MIP), The Contract Logistics Observatory	Private University	National	Italy
Budapest Metropolitan University (BMU)	Private University	National	Hungary
University of Padova (UP), School of Engineering	Public University	Regional	Italy
University of Gothenburg (UG)	Private University	Regional National International	Sweden
Chalmers University of Technology (CUT)	Private University	National International	Sweden

TABLE 4 - MAIN CHARACTERISTICS OF INVESTIGATED HEIS
FROM WHICH THE GOOD PRACTICES ARE DERIVED

Based on the review of the cases it can be concluded that various *parties are involved in the knowledge triangle* (Table 4): 12 universities (including University of Zaragoza); 8 research institutions or centers; 7 public authorities (regional and/or state administration); 2 foreign partner institutions (Massachusetts Institute of Technology; World Economic Forum Global Agenda Council, etc.); a science park; the private business sector in the respective countries; 2 leading logistics associations in the respective countries (Austrian Logistics Association – Bundesvereinigung Logistik Österreich – BVL; Bulgarian Logistics Association – BLA) and 3 professional bodies representing the industries in the field of logistics (Chartered Institute of Logistics

and Transport – CILT; the Chartered Management Institute – CMI; Chartered Institute of Procurement and Supply – CIPS); students and alumni in the respective countries. All these parties collaborate with each other in order to ensure that the created knowledge is valuable for businesses and society. However, among the actors mostly involved in KT besides HEIs, the private sector plays a special role, which can be considered from different perspectives: as a unit to conduct research in (researchers and students can carry out various experiments using companies as a working laboratory); as a beneficiary, having access to research results, training, innovations and talents; as a financial contributor to research and educational initiatives; and as a source of instructors. On the other side, there are practices illustrating collaboration between actors of one and the same type. For example, the collaboration between HEIs is expressed predominantly by joint education and research activities in the area – dual programmes, strategic alliances (e.g. the Leiden-Delft-Erasmus strategic alliance), etc.

Good Practice	Parties involved in the Knowledge Triangle
Zaragoza Logistics Center (ZLC), Spain	- ZLC – a research institute that is attached to the University of Zaragoza; - University of Zaragoza – ZLC maintains close institutional relationships with the University of Zaragoza; - State administration – Spanish Ministry of Education and Science; - Regional administration – Government of Aragon; - Massachusetts Institute of Technology (MIT) – supports the development of educational activities at ZLC; - Ibercaja and EU are facilitators of KT (funding of the research/educational activities); - Private business sector represented by the companies from PLAZA S.A.; - Students.
Rotterdam School of Management, Erasmus University, the Netherlands	- Erasmus University Rotterdam and its various units; - the Dutch government and its structures; - the Rotterdam city government; - the port of Rotterdam and private sector; - Leiden-Delft-Erasmus strategic alliance between eight inter-university theme-based centers. The activities of one of the centers are directly related to logistics and supply chain management – The Centre for Metropolis and Mainport. - Other research institutes and universities; - Students and alumni.
The University of Huddersfield, UK	- The University of Huddersfield through its Business School's Department of Logistics, Operations, Hospitality and Marketing. - NOVUS Trust – an innovative initiative, bringing industry and the university together to enhance the education - including a total of 30 companies from the retail sector (like ASOS, Sainsbury's and Morrisons), manufacturing (such as PZ Cussons, Cummins and Arla) and logistics (DHL, Wincanton, CEVA). - Government - through its regulations and funding schemes - Students - Business

University of National and World Economy, Bulgaria	- UNWE represented by its Department of Logistics. It is the only one in the country that offers logistics education at all three educational levels –bachelor, master and PhD; - The Centre for Logistics Research at UNWE – an ancillary unit to the Department of Logistics; - Non-profit organisations – Bulgarian chamber of commerce and industry, Bulgarian industrial association, Bulgarian logistics association, Bulgarian association for management, development and entrepreneurship, Association of the Bulgarian enterprises for international transport and roads; - Manufacturing and commercial companies with well-developed logistics departments, logistics service providers and suppliers of logistics equipment and software.
Montan University Leoben, Austria	- MUL – main expertise is Industrial Logistics with a special focus on logistics systems design and engineering, material flow management, process optimization, production planning and control, warehouse automation and information flow management. - Chair of Industrial Logistics at the Montanuniversitaet Leoben (MUL) - integrates engineering education and education in logistics management with a high degree of practical experience. - Companies - KNAPP Systemintegration, Leoben – specialised for end-to-end logistics solutions in complex and highly automated warehouse areas. The company's core competencies lie in the conceptualization and development of complete logistical solutions and their realization as system supplier and general contractor. - SSI SCHAEFER, Friesach – one of the largest logistics providers worldwide - more than 900 employees and 1,400 installed systems. Their logistics software offers transparent control and monitoring functionalities as well as an integration of the systems in intralogistics processes. From manual to fully automated, the software cover all logistical areas within a warehouse. - Bundesvereinigung Logistik Österreich (BVL Austria) – the leading logistics association in Austria, representing the major companies in industry, retail and logistics services. BVL Operates competence centres in automotive logistics, transport, industry, retail, sustainable logistics and logistics automation.

Hull University Business School, UK	- Hull University Business School – aims at providing fresh insight to public and private sector organisations of all sizes on a regional, national and international level, achieving tangible results for business. - The Logistics Institute at the university – offering activities comprising membership, events, short courses, consultancy, academic degree programmes, technology development and demonstration, and business incubation space. - The Logistics Institute is working in conjunction with the World Economic Forum Global Agenda Council on the Future of Logistics and Supply Chains, to produce an innovative report on the impact of the Internet of Things (IoT) in the industry.
Jönköping University, Sweden	- Jönköping University – different Research Groups (each of the four schools has its own designated focus areas and research activities). In some fields research is conducted in collaboration between two or more of the schools. - Centre of Logistics and Supply Chain Management (CeLS) – a research and learning center within the L&SCM field at Jönköping International Business School, in close cooperation with industry, local and regional municipalities, other national and international universities. - Science Park Jönköping – students and staff at Jönköping University get help shaping their business ideas into actual businesses. - During 2014 Jönköping University started a number of national collaborative projects in order to strengthen strategic interactivity between universities and society in Sweden.
Politecnico di Milano School of Management, The Contract Logistics Observatory, Italy	- Politecnico di Milano Department of Industrial Engineering (DIG). - Contract Logistics Observatory. - A group of 20 companies, partners of the Observatory, who pay an annual membership fee.
Budapest Metropolitan University, Hungary	- Budapest Metropolitan University. - Companies: TATA, ERSTE Bank, ITCB (Institute for Training and Consulting in Banking), FHB Bank.

University of Padova, School of Engineering, Italy	- University of Padova. - T.I.M.E. network gathering 54 of the world's leading Technical Universities and Engineering Schools, and offers over 30 B.Sc. - Bilateral agreements with U.S.A., China (CSC), India and Brazil (Science without Borders). - Local companies and laboratories.
University of Gothenburg, Sweden	- The only Swedish institution that has Centres for Research and Education - Participates in about 2,300 collaborative projects - Strong connection with the research sector - Connecting companies that need expert support to handle organisational changes, staff training - Connecting public authorities that need help with independent studies and analyses
Chalmers University of Technology, Sweden	- Chalmers Production - a platform for research in manufacturing, production systems and product development - The Production Area of Advance congregates more than half of all Chalmers departments, five research centres and three closely linked research environments, 25 research groups and a network of collaborating industries - Over 200 researchers are involved in Chalmers Production Area of Advance-

TABLE 5 - PARTIES INVOLVED IN THE KNOWLEDGE TRIANGLE

The observed HEIs applied various KT practices which are presented in details in the Annex 2. Although at first glance some of the practices applied appear to be nearly identical, they are quite different and have different priorities (as it is presented in the further analysis below. However, they can be summarized in more general terms into strategies and initiatives basically concerning the main actor involved as needed inputs to the knowledge transfer. There are also practices that are more common among the cases and some that are specific for one or quite a limited number of cases.

Frequency of appearance	Main actors involved	Strategies and initiatives
Common	HEI	- Fostering academia-industry interactions (e.g. through Honours programme) - Creation and management of Research Centres - Executive education courses designed for business (including customized ones) - Students visiting company facilities - Organizing forums for presenting student research projects
	Research Institutions	- Fostering applied contract research - Organizing forums for networking and discussions between companies and researchers
	Business	- Companies conducting Master classes and Guest lectures
Specific	HEI	- Dedicated unit for knowledge transfer and cooperation with external partners
		- Expert consulting
		- Collaborating with business in developing educational programs
		- Innovative teaching methods such as student projects, simulations and interactive games
		- Dual programmes combining study and work experience
		- Student internships in the partner companies
		- Hiring regular lecturers with longstanding experience in the field of logistics
		- Creation of a Virtual Logistics Game to generate logistics awareness among school age children
		- Case Development Centre for the support of case-based management education
		- The scientific progress of the doctoral students is encouraged via policies for participation in university, national and international projects and events
		- Organizing "Career days" as a job fair with the participation of business representatives
		- Organizing thematic platforms for strategy and long-term collaboration directly relevant for industry and society
		- A logistics association receives support from a university for launching and functioning of a job-search website specialised in logistics positions

	Research Institutions	- The Advisory board of a Research Centre is made up of lecturers and industry representatives - Development of a Science Park providing support for start-ups and growth of business ventures with students - Providing facilities – access to state-of-the-art technology and new methods of analysis
	Business	- Providing logistics specific software products to HEIs for educational purposes - External employment of doctoral students for a specific project - Companies support the establishment of a Logistics Lab at the university by providing technology and software - Company mentoring students - Joint Venture between the business organisations, the municipality, and the HEI - Logistics Association serves as a neutral platform facilitating cooperation between the partners, some of which can be competitors in the marketplace

TABLE 6 - STRATEGIES AND INITIATIVES ACCORDING TO THE FREQUENCY OF APPEARANCE AND MAIN ACTORS INVOLVED

The existence or predominance of some practices over others generally seems to be dependent on the *external and internal conditions* created for the knowledge triangle. While the external conditions refer to the opportunities stemming from the external environment (local or/and national policies and initiatives, advantages due to a particular location such as proximity to logistics parks, ports and other logistics infrastructure, etc.), the internal ones are dependent on the HEI itself and result from the established organizational structure and governance, the adopted mission statement and vision, etc.

In the case of *policies and initiatives of public authorities* (local or national), it is observed that they are critical drivers for integration of the knowledge triangle activities, facilitating and encouraging the interconnection of education, research and innovation or determining the course of action on a local and national level. For instance, the Dutch government strategy (in the case of Erasmus University Rotterdam – EUR) is focused towards creating and disseminating innovation in logistics, which is one of the “Top sectors” in the Netherlands and receives high government priority. Through the establishment of an appropriate part-

nership mechanism (Topconsortium voor Kennis en Innovatie – TKIs), based on the top sectors policy there, in which the government, industry and academia in these sectors work together to draw up research and innovation roadmaps and to implement research projects to realize the Top Sector ambitions, a favourable environment is created that supports the integration of all three knowledge triangle groups – research, education and innovation. Similarly to the Dutch case, one of the UK schemes (the Knowledge Transfer Partnerships – KTPs) facilitates the knowledge exchange and drives the UK HEIs to take different initiatives aimed at knowledge transfer. They consist of a three-way partnership between an external partner (a business, some public sector organizations and charities), a graduate (known as the Associate) and an academic. Also, in terms of external support the example of Zaragoza Logistics Center – ZLC could be pointed out, where the creation of the center was inspired by the recognition of the Government of Aragon that the region can achieve an unprecedented economic growth only by fostering innovation, where the role of the center is to contribute actively to this innovation through knowledge dissemination.

Additionally to the policies and initiatives of public authorities, *the particular location* of HEI determines the context in which they carry out its activities. The proximity to logistics parks, ports and to other logistics infrastructure is vital for knowledge triangle integration in the field of logistics, because it physically strengthens the relations between academia, industry and society and intensifies the flows of knowledge between them. The close proximity of the ZLC to one of the largest logistics parks in Europe – PLAZA, EUR - to one of the largest ports in the world – the port of Rotterdam, University of Gothenburg – proximity to a port, are just some examples of such natural conditions for knowledge transfer and effective interactions between KT parties. For instance, while the PLAZA's companies are used for various experiments of the ZLC's researchers and students, they can gain access to state-of-the-art research, innovative ideas and young talents. The location of EUR is also a key to the excellence in research and education, providing such a "living lab environment" which enables opportunities for knowledge transfer. In the case of EUR the interactions between academia, society, business

and government in the field of logistics are facilitated through Smart-Port initiative.

As mentioned earlier, the application of the analyzed practices is determined by *the internal conditions* created by the HEI itself (the adopted mission, vision, values, and organizational structure and governance). All of the presented *mission statements* certify that the observed HEIs placed a strong emphasis on knowledge triangle. For instance, the mission of the University of Huddersfield (HUD) is “to deliver an accessible and inspirational learning experience; to undertake pioneering research and professional practice; and to engage fully with employers and the community”; the ZLC’s mission is “to create an international center of excellence for research and education in logistics and supply chain management that actively engages with industry and the public sector to develop and disseminate knowledge”; the EUR’s mission is to “internationally, nationally and regionally, develop talent and produce knowledge at the academic level, for individuals, business and society”. In spite of the fact that knowledge transfer between the academia, society and business is addressed in all of the above missions, the scope and intensity of knowledge flows are different, notably regarding their direction and parties’ participation. In terms of direction, the knowledge transfer can be divided into two classes: *one-way flow of knowledge* (the transfer from academia to the business sphere or society is a common practice such as the case of HUD), *two-way flow of knowledge* (transfer mentioned and vice versa such as the ZLC’s and EUR’s cases). In terms of parties’ participation, the knowledge transfer can take various forms: transfer from business to education or from education to innovation, where the HEI plays a mediating role; transfer from research to business or from business to research; transfer from research to education or from education to research. Some of the practices that comply with the relevant transfer are illustrated below. Here, it is necessary to clarify that this doesn’t mean that particular HEIs only apply such practices which are respective to one of the types of knowledge transfer in terms of direction (one-way or two-way) or parties’ participation, but the intensity is different. Furthermore, the presented missions underline the level at which the HEI’s focus is directed – e.g., locally, nationally, or internationally (as reflected in the declared missions).

Based on the above perspectives and discussions, and the information provided in the cases, it can be asserted that the HEIs that have a strong professional orientation and a focus on employability, apply such practices that address the link between theoretical knowledge and practice and the intensity of knowledge flows between business and education, such as:

- *Practical orientation of the study materials* – simulations and interactive games (such as Fresh Connection – a supply chain simulation game), experience in industry specific software (such as SAP ERP information system), business case discussions, engaging students to take part in international competitions and debates (e.g. APICS Case Competition and Fresh Connection), etc.;
- *Engaging business in education* – organizing open lectures presented by professionals (such as the initiative of the University of National and World Economy – UNWE in Bulgaria – “Meet the business – be successful in logistics”; EUR’s Distinguished Lecture Series and others), jointly realized study programmes, hiring regular lecturers with longstanding experience in the field of logistics, mentoring, scheduling company facilities visits, sites visits for project work, sponsoring students’ thesis projects (such as ZLC’s ZAP program) etc.;
- *Development of a competency based approach to curriculum design* – engaging the industry in the design of courses or the development of the courses is supported by both the business and the respective professional bodies representing the industries in the field of logistics (such as Chartered Institute of Transport and Logistics – CILT, and the Chartered Institute of Procurement and Supply – CIPS for some of the courses provided by the University of Huddersfield in UK, Austrian Logistics Association – BVL for Montanuniversitaet Leoben’s courses, Bulgarian Logistics Association for UNWE’s courses offered by the University of National and World Economy in Bulgaria, etc.);
- *Contract education* – offering customized (e.g. the Maersk Liner Graduate Programme for the staff of the world’s largest container shipping company – Maersk Line) or not customized (series

of seminars, executive programmes, etc.); training carried collaboratively with industry (e.g. the executive program “Leading your value chain transformation” is provided jointly by the ZLC-MIT and Accenture).

- *Internships and dual programmes combining study and work experience* – creation a virtual job search platform specialized in logistics positions, supporting the internships and employment, organizing job fairs, developing internships schemes (such as schemes of Budapest Metropolitan University and Montanuniversitaet Leoben), sandwich courses – a work placement is integrated into the course (NOVUS scheme applied in HUD).

The following points should be mentioned when summarizing the above section.

The transfer from education to innovation can be seen through practices such as joint projects, workshops, internships etc. For instance, the development of master’s degree projects with companies allows students, on the one hand to put into practice the concepts learned in the classroom and apply them to real problems of companies, and on the other, to help companies to find solutions (ZAP program is such an illustrative example). Another example is company sites visits for project work. These initiatives help students to develop their problem solving capabilities through the experience in application of logistics techniques and tools (one day problem solving workshops) on the one hand, and present a further option for companies to use fresh ideas from students on the other.

The transfer from business to education mainly is presented by business participation in educational activities of the HEI: companies can be both a host and HEI’s guest to present lectures to students; participation of professionals in HEI’s advisory board; mentoring (e.g. more than 100 industry people are involved in mentoring Huddersfield’s students – they include senior directors and managers from many different businesses and industries); business visits (they enable students to learn how companies organize and manage the logistic processes in real life, and to see the latest technology and implemented innovations); field trips

(logistics facilities visits such as Rotterdam port and Schipol airport; manufacturing facilities, distribution centers, etc.); support the thesis research of students (sponsoring; joint research activities); etc.

Besides knowledge transfer between the business and HEI in terms of education, the mentioned parties also collaborate with each other in research activities. The HEIs that are predominantly research-centred institutions, carried out joint activities not only through contract research, which is a dominant practice, but engage industry in their research through various forms of collaborations and mechanisms. The practices that these HEIs apply are: *contract research; involving companies as demonstrators in projects; business's support for research and innovation activities* (e.g. the case of MUL where some companies support the establishment of a logistics lab at the university by provide technology and software); *offering flexible PhD programmes* (part-time PhD programme targeted toward business professionals interested in further developing their academic skills, aiming to produce new and practical knowledge, helping their business grows and innovates); *providing assistance and consultancy to business*, etc. Some HEIs *organize special events* (seminars, workshops or conferences) open to the supply chain community, bringing a number of companies and professional organizations. Through them the results of the research are presented; insights, practices, models, even reservations about the way ahead between the participants (scientists and experts) are shared (e.g. ZLC organize Global Supply Chain Research Forum; the Department of Logistics at UNWE has so far organized ten conferences "Logistics in a changing world"). Some of the investigated HEIs attract business through flexible and beneficial agreements, based on the developed formal incentive mechanism for industry participation in education and research. There are different levels of collaboration between HEI and business. Traditionally the lowest levels of collaboration address the support of education (sponsoring of thesis and internships), the highest include support for research (e.g. funding a professorial chair to access pioneering results from research). For instance, ZLC has developed a corporate programme that offers companies three levels of collaboration (Academic partner; Research partner and Corporate partner). The preliminary defined levels of collaborations

by the Contract Logistics Observatory of Politecnico di Milano School of Management (MIP) are: partnership; sponsorship; and participation to the research free of charge.

The integration between research and education is done through a small number of practices. The knowledge flows are traditionally more frequent and intense concerning education (knowledge transfer from research to education) – incorporating knowledge in the curricula or organizing various workshops to transfer research outcomes to students (e.g. as it is in the case of The Contract Logistics Observatory of Politecnico di Milano School of Management – MIP). However, there is an opposite direction of the knowledge flows – from education to research through engaging students in the HEI research activity (e.g. the Supply Chain Management Honours programme; students are invited to take part in the HEI research projects; fostering student to participate in scientific conferences, workshops and poster exhibitions (e.g. in Chalmers University of Technology – CUT, UNWE, EUR, ZLC and others), etc.).

Furthermore, *the organizational structure and governance* lay the base of connecting education, research and innovation. In order to ensure smooth coordination between the KT different initiatives the studied HEIs use various channels for knowledge transfer activities. For instance, ZLC has a dedicated unit for knowledge transfer – Knowledge Transfer Office (KTO), EUR launched the Erasmus Centre for Valorisation (ECV) with the main aim to make the academic knowledge suitable and accessible for economic and social application. These structures are dedicated to be a focal point for knowledge transfer activities. Other structures that support the interactions between parties involved in the KT are those that provide career assistance – units dedicated to help students find excellent jobs and engaged in organizing companies' visits to HEI's campus. In this regard initiatives that support the career service are job fairs (e.g. the "Career days" annually organized by UNWE). An interesting initiative that supports the internships and the employment is the launch of a job-search website specialized in logistics positions (such a platform is launched in Bulgaria).

In order to ensure that the academic activity is adequate to community requirements, the HEIs develop various strategies and apply

a number of practices. In terms of HEI's governance, the governance structures of some of the HEIs comprise representatives from the public and private sectors. Here, it is important to note that such an involvement in HEI's governance can facilitate the alignment of research and educational activities with the needs of the society and business which is at the base of the KT concept. For instance, the Advisory Board of one of the EUR's units that provide education in the field of logistics and supply chain management (RSM) is comprised of distinguished leaders from business and the public sector (City of Rotterdam, KPMG Netherlands, Shell International Exploration and Production, Heineken, TNT Express, Siemens Nederland, Port of Rotterdam Authority and others). The goal of their inclusion is to connect RSM with issues and practices of management in both public and private sectors. They advise the school on three levels: ensuring that its educational programmes serve the needs of business; ensuring that its research adds value to business practices; guaranteeing that RSM benefits its corporate partners, students and alumni. This provides an on-going pipeline of ideas, knowledge and advice that serves to shape RSM's strategic agendas. Other support systems and strategies for better integration of all the three KT elements are: designing programmes on the basis of those of the worldwide leading universities, international partnerships and exchange agreements with academic institutions, offering courses taught in English, etc. The programmes that are modeled on programmes of leading universities (e.g. the ZLOG programs are modeled on a MIT Supply Chain Management Program) will not only attract international students but the business will be ensured that the university is a reliable partner for education and talent development in the area of logistics and supply chain management. A common strategy of those HEIs that put a strong emphasis on internationalisation of education includes not only offering dual degree programs with foreign academic institutions, but also developing courses taught in English with the aim of attracting more international students. Here it should be stressed that the internationalisation of education is important because thus a prototype of international working environment is created that has become the norm in the area of supply chain management.

7. Conclusions and Recommendations

Recommendations

Based on the analysis of the selected good practices various recommendation can be made. Some of them are presented below and summarised in Table 7. These recommendations can be formulated as fifteen guidelines. Their application favours the integration of the knowledge triangle groups – research, education and innovation. The goals of such guidelines are to facilitate the HEI's choice of practices and to give reasons for the application of some practices rather than others. The guidelines cover the following fields: **education**, **research**, **organizational change** and **external support**, and are as follows:

Education

Focus on applying experimental approach in education

- Achieving balance between theory and practice helps students see the link between theory and practice and deepen their knowledge. It also gives the students the opportunity to get a first-hand understanding of the real industry processes and provides them with the opportunity to network with high level executives. Enablers for this are:
- Putting partnership with practitioners at the heart of the approach;
- Involvement of business experts in education – delivering courses (hiring regular lecturers), guest lectures (such as presentations of company's operations to students; "Meet the business – be successful in logistics" initiative etc.), seminars, mentoring, panel members in student competitions, company visits and field trips;
- Intensive Alumni interactions (Alumni Lecture Series; career advice and mentoring);

Using innovative teaching methods such as case studies and projects, industry specific software experiencing, simulations and interactive games.

Development of a competency based approach to curriculum design

In order to ensure that the educational programmes serve real needs of business and give students exactly the skills they need HEIs should emphasize on the development of a competency based approach to curriculum design. This can be achieved through engaging the industry in the design of courses and knowledge transferring from research into the curricula.

Internationalisation of education

The multicultural environment which is the norm in the area of supply chain management can be created through partnerships with foreign universities, offering dual degree programs and fostering the mobility of students.

Focus on executive education programmes

Not all of the observed HEI offer executive education, which limits the collaboration potential. It should be kept in mind that providing education for professionals in practice contributes to the enlargement of the HEI's network partners. One of the ways in which such initiatives can be deployed is through encompassing those companies with which HEI has already partnered. The specific needs of the business can be met by developing courses on a part-time basis for professionals; offering customized programmes, allowing companies to tailor-make a curriculum according to their own interests and priorities.

Internships and Dual programmes combining study and work experience

Internships not only reveal the application of the theoretical concepts in practice, enabling students to enrich their experience in the business, but benefit companies too, providing access to knowledge and expertise that can lead to innovations and recruiting opportunity for new talents. During internships students have the opportunity to develop their thesis on real-life logistics problems, working together with business on concrete issues with industry professionals and taking advantage of their infrastructure and information systems while writing their thesis. In order to achieve this HEIs have to stimulate the creation of a stable part-

nerships with business through developing internships schemes (such as NOVUS scheme), developing of a formal incentive mechanism for industry participation in education (such as ZAP program), etc.

Fields	Reccomendations	Enablers
Education	Focus on applying experimental approach in education	- Putting partnership with practitioners at the heart of the approach; - Involvement of business experts in education - Intensive Alumni interactions; - Using innovative teaching methods such as case studies and projects, industry specific software experiencing, simulations and interactive games.
	Development of a competency based approach to curriculum design	- Engaging the industry in the design of courses; - Knowledge transfer from research to curricula development.
	Internationalisation of education	- Focus on establishing partnerships with foreign universities and on fostering the mobility of students; - Offering dual degree programs.
	Focus on executive education programmes	- Developing courses on a part-time basis; - Allowing companies to tailor-make a curriculum according to their own interests and priorities.
	Internships and dual programmes combining study and work experience	- Stimulating the creation of a stable partnership between the HEI and business; - Launching of a job-search website specialized in logistics positions; - Developing internships schemes.

Research	Engaging students in the research activity of the HEI	- Experimental work on projects; - Participation in conferences; - Participation in research and surveys related to education or logistics practice.
	Focus on new and practical knowledge	- Attracting business professionals to produce new and practical knowledge through developing flexible research degree frameworks on a part-time basis (PhD and Master research programmes), allowing business professional's to conduct research in field related to their professional interest; - Contract research; - Expert consulting.
	Fostering transparency and openness	- Organizing events (forums, conferences, workshops etc.); - Research magazines and online platforms.
	Internationalisation of science	- Partnerships with foreign universities; - Seeking opportunities through EU projects
Organizational change	Developing knowledge transfer environment	- Providing Facilities such as a Logistics Lab, Science parks; - Creation of Research Centers.
	Stimulating interactions with business	-Developing of a formal incentive mechanism for industry participation in education and research.
	Using a dedicated channel for knowledge transfer activities	- Creation of dedicated unit for knowledge transfer and cooperation with external partners.
	Shared governance model	- Incorporating business and other institutions in the HEI's governance and in the academic affairs.
	Evaluation and monitoring of the impact of knowledge transfer	- Development of number of knowledge transfer indicators to measure success.
External support	Support from professional bodies, - state and regional administration	- Establishing and maintaining relationships with professional bodies; - Establishment of partnership mechanisms for knowledge transfer; - Providing scholarships.

TABLE 7 - PROPOSED RECOMMENDATIONS AND ENABLERS

Research***Engaging students in the research activity of the HEI***

In order to expose students to new learning environments and to create strong links between education and research, HEIs should provide respective opportunities to the students such as: participation in research and surveys related to education or logistics practice; experimental work on projects; participation in conferences; inclusion in HEI's research projects and events, etc.

Focus on new and practical knowledge

The focus on new and practical knowledge can be done in various ways. On the one hand, developing flexible research degree frameworks on a part-time basis (PhD and Master research programmes) can attract business professionals to produce new and practical knowledge in fields related to their professional interest. On the other hand, practical knowledge can be extracted through contract research and expert consulting. In spite of the fact that expert consulting relies primarily on already existing knowledge and techniques and is not intended to produce new research results, valuable information can be derived during consulting processes, in which members of academic community try to solve business problems and give advice for future innovation projects and development. Additionally, the companies can be involved to participate in various projects as demonstrators. This not only benefits the companies, but their participation contributes to the validation of the applicability of the approach developed by researchers. Thus, in order to increase the number of the privately funded research projects, HEI should focus on the mechanisms of motivating business. One of the instruments of such motivation can be the publicity gained from the resulting publications, which should not only deal with the researched hot topic areas, but should also be realized in prestigious journals.

Fostering transparency and openness

Through organizing events (forums, conferences, workshops etc.) in which the main participants are business experts an opportunity is created for networking and discussions about the latest research trends, for

opening minds to new ideas, and providing new ground for research. During these forums experts can share their insights, practices, models about the future trends. Besides the above initiatives the strong relationships between business, academia and society can be facilitated through research magazines and online platforms, combining challenging articles with videos and interviews.

Internationalisation of science

The joint research partnerships with foreign universities provide the following benefits: gaining knowledge about applied KT approaches by others and improving HEI's capabilities and practices; enhancing knowledge through its convergence; using the advantages which can be derived from various cultures and nationalities; expanding international connections.

Organizational change

Developing knowledge transfer environment

In order to facilitate the relationships between parties, the appropriate knowledge environment should be developed. This can be achieved through providing facilities such as a logistics lab, developing science parks and creation of research centers. Thus the parties will have an access to state-of-the-art technology and to new methods of analysis; start-ups should be supported, etc.

Stimulate interactions with business

The interactions between academia and business could be enhanced through the development of a formal incentive mechanism for industry participation in education and research (such as ZAP program and corporate program).

Using a dedicated channel for knowledge transfer activities

The creation of dedicated units for knowledge transfer and for cooperation with external partners (such as Inter-university center for career development in UNWE, Knowledge Transfer Office of ZLC, Erasmus

Centre for Valorisation, etc.) will smooth the coordination between the different KT initiatives and will support the connection between companies, students and experienced researchers.

Shared governance model

Incorporating the business and other institutions in the HEI's governance will be beneficial to the alignment of research and educational activities with the needs of society and business.

Evaluation and monitoring of the impact of knowledge transfer

The HEIs need to develop a number of knowledge transfer indicators to measure success. The results of the assessment will provide adequate directions how to use the potential of knowledge transfer more effectively.

External support

Support from professional bodies, state and regional administration

In order to facilitate knowledge triangle activities, HEIs should be active in encouraging the establishment of partnership mechanisms such as Knowledge Transfer Partnerships and Top Consortia for Knowledge and Innovation and should strive to establish and maintain relationships with professional bodies (logistics associations and others).

Annex 1

Template for the Good Practices Description

Section 1: Introduction
1.1. National and Regional Framework/Context
1.2. University Establishment
1.3. Organizational structure and Governance
1.4. University research and education
Section 2: Parties involved in the Knowledge Triangle
Section 3: Integration of Education in the Knowledge Triangle
3.1. Drivers of the Education Model
3.2. Specific Education Initiatives
3.3. Strategies and Support Systems for the Knowledge Triangle
Section 4: Collaboration with External Partners
4.1. Extensive university-research-industry partnerships
4.2. Strategic cooperation agreements with industry
Section 5: Main Challenges, Key Success and Enabling Factors
Section 6: Future Developments and Transferability
Section 7: Lessons Learnt and Recommendations
Section 8: Contacts and References

Annex 2
Good Practices Extracted from the HEIs Observed

Main actor involved	Good Practices
HEI	Collaboration between the parties in developing educational programs useful for university and business
	The programmes are modeled on programmes of leading universities in the field of logistics and supply chain management
	Internationalisation of the curriculum – the courses are taught in English
	Offering dual degree programs with other HEIs
	International student exchange with HEIs abroad (optional or compulsory)
	International student exchanges with business (e.g. field trips in the Netherlands)
	Practical orientation of the study materials (business case discussions)
	Practical orientation of the study materials (simulations)
	Practical orientation of the study materials (interactive games)
	Practical orientation of the education (business visits and field trips)
	Students are engaged to take part in international competitions and debates (APICS Case Competition, Fresh Connection)
	Hiring regular lecturers with longstanding experience in the field of logistics
	Organizing forums for presenting students' research projects and for networking and discussing between companies and students
	Case Development Centre specialized in case writing for the support of case-based management education.
	Offering dual programs combining study and work experience/sandwich courses placements
	Student internships in the partner companies
	Having a dedicated unit for career service – job placement through providing contacts or through dedicated office/mediator, supporting the interview conducting

	Organizing Job fairs with the participation of business representatives such as “Career days”
	Support the creation of a job-search website specialized in logistics positions
	Offering customized courses for business
	Offering executive education programmes
	Assistance and consultancy to business
	Having a dedicated unit for knowledge transfer and cooperation with external partners – such as Knowledge Transfer Office of ZLC and Erasmus Centre for Valorisation
	Creating and publishing magazines acting as a bridge between management research and business practice
	Creation and management of Research Centres for Logistics and Supply Chain Management which work directly with organizations to address the challenges that business faces
	The scientific progress of the doctoral students is encouraged via policies for participation in university, national and international projects and events and in different form (case studies, reports, surveys, etc.)
	Providing seminars addressing challenging questions and involving renowned scientists, students, representatives from industry
	Prominent students are included all HEI’s research projects and events – experimental work on projects, participation in conferences, research and surveys related to education or logistics practice
	Students are involved in workshops and poster exhibitions
	Flexible PhD programmes (opportunity to combine their studies at different HEIs simultaneously)
	Flexible PhD programmes (part-time PhD programme) targeted toward business professionals
	Formalizing different levels of interaction with business in research and/or in education/Offer memberships/formal incentive mechanism for industry participation in education and research
	Encouraging alumni interactions by launching an online platform such as “MentorMe” that facilitates connections between students and alumni with regards to career advice and one-on-one mentoring
	Encouraging alumni interactions through providing support for alumni events

	Developing of knowledge transfer indicators for measuring success
	Research collaborations with other HEIs and international institutions in Logistics and supply chain management
	Being a partner in technological parks
	Creation of a Virtual Logistics Game to generate logistics awareness among school age children
Research Institutions/ HEI	Inclusion of companies, representatives from the public sector, etc. in the advisory board, ensuring that HEI's educational programmes and research serve the needs of business and society
	Organizing forums for networking and discussing between companies and researchers – logistics conference, seminars and workshops. Through them the results of the research can be presented. Experts from all over the world can share their insights, practices, models, even reservations about the way ahead.
	Organizing PhD Summer Academy (usually annual)
	Establishing competence centers
	Offering contract research
	Development of a science park providing support for the start-up; development and growth of business ventures with students accessing the resources; offering business incubation space
	Involving companies as demonstrators in projects
	Providing Facilities – access to state-of-the-art technology, new methods of analysis and cutting-edge research infrastructures
	Workshops are organized to transfer outcomes of the HEI's research to students

Business	Thesis and student projects are developed jointly with industry
	Companies mentor students/ Mentoring
	Providing lecturers from industry for HEIs
	Making company presentations at HEIs
	Open lectures presented by professionals such as Distinguished Lecture Series and "Meet the business – be successful in logistics"
	The companies support the establishment of a logistics lab at the university by providing technology and software.
	Providing logistics specific software products to HEIs for educational purposes helping students to experience industry specific software
	Employment of doctoral students for a specific project
	Establishing joint ventures between the business organisations, the municipality, and the HEI
	Companies training are carried collaboratively with HEIs/ executive education is provided by both the HEI and partner companies.
	Initiating alumni Scholarship
	Participating in Alumni Lecture Series
	Providing alumni mentoring
	Companies provide PhD Sponsorship
	Sponsoring students' thesis projects – such as ZAP program
	Funding a professorial chair to access pioneering results from research
	A logistics association serves as a neutral platform facilitating cooperation between the partners, some of which can be competitors in the marketplace
	Government provides scholarships

DEFINING A KNOWLEDGE TRIANGLE FRAMEWORK FOR THE LOGISTIC AREA

Dott. Scipioni Sara, University of Pisa

Prof. Giannini Marco, University of Pisa



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1. Definition of Knowledge Triangle (KT) and its application to the Logistic area: an Integrated Knowledge Triangle

The Knowledge Triangle (KT) is a policy framework that stresses the need for an integrated approach towards research, innovation and education policies. This framework has its own basis in the national innovation systems framework (NIS), which emphasises the systemic nature of innovation and the important role of different actors involved¹. The implementation of such framework tends to enhance the overall performance of national systems, with the launch of a virtuous cycle, and can be applied to several economic areas.

Specifically, FRAMELOG aims at developing a common European framework for the logistic profession, which represent a strategic figure in the current industrial panorama.

Basically, the three actors which will be considered are described below:

- A. *Higher Education Institutions (HEI)*. Notwithstanding the differences in its applications, the knowledge triangle approach always attributes a central role to higher education institutions in fostering the integration of innovation, research and educational activities. Also for the logistic profession, HEIs perform the most important role in the creation of theoretical and professional competences requested by the labor market. The analysis of the performed methods in both organization and offer of higher education systems will enable the evaluation and improvement of the whole triangle.
- B. *Research Institutions*. As the European Union underlines as priorities the timely response to innovation challenges and the gain of EU leadership in industrial technologies, research institutions represent the key actor to guide the change. The continuous investments for developing innovative theories and applied research are fundamental for the profession to grow, gain a relevant position between competitors and maintain competitiveness in the future. A fruitful link

1. (OECD, 2016).

with education and business may enable research institutions to produce even more effective results and stimulate the improvement of the whole logistic area.

- C. *Companies.* The role of experienced professionals, from high-level executives to the operating arms of successful companies in the logistic area, is essential to deeply understand the needs of the logistic profession in the economic markets. In the project it will be carried out an analysis of good practices, critical issues and future prospects of the business side.

The representation of the basic Knowledge Triangle is presented below:

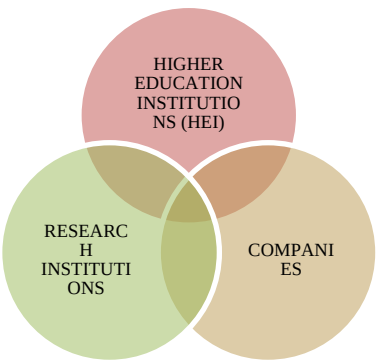


FIG. 1 - BASIC KNOWLEDGE TRIANGLE REPRESENTATION (ELABORATION BY THE AUTHORS)

As the borders between the area of expertise of some relevant actors are at times not clearly definable, a more complex elaboration of the Knowledge Triangle has been developed by the authors in the following paragraphs.

Firstly, since HEIs consist of several different figures, such as private institutes, public entities or hybrid forms of them, it is essential to differentiate between those entities. Between those figures, the most relevant one is identified by Universities, which offer both education and research.

ch activities. Following this analysis, in a more representative description of the KT, this actor should be inserted halfway between HEI and Research Institutions.

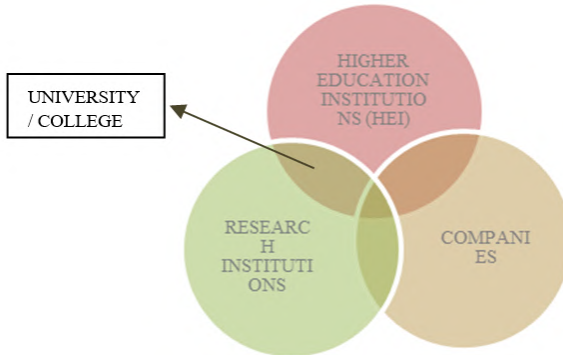


FIG. 2 - INTEGRATED KNOWLEDGE TRIANGLE REPRESENTATION
- UNIVERSITY (ELABORATION BY THE AUTHORS)

Secondly, in the investigation of the actors that participate in the field of research, it is important to recognize the role of Research&Development Departments inside the leading companies in the industry. Although they usually focus in the major area of interest of their company, the constant search for new technologies or working methods and its dissemination between partners and competitors is crucial to create an indirect growth in the whole industry. Therefore, to include this figure in the KT, it should stand between Research Institutions and Companies.

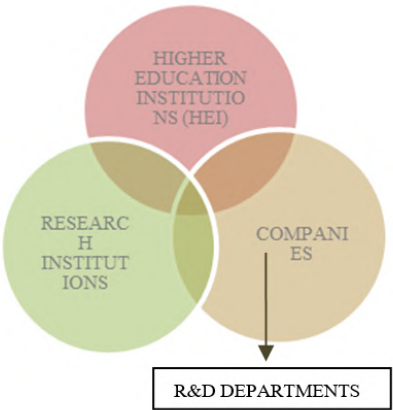


FIG. 3 - INTEGRATED KNOWLEDGE TRIANGLE REPRESENTATION - R&D DEPARTMENT (ELABORATION BY THE AUTHORS)

Thereafter, midway between Companies and HEIs is possible to include the Corporate Universities, a University-style campus set up by a company to provide tailored learning, training and development activities for its own staff, in fact it is defined as “a strategic tool designed to assist its parent organization in achieving its goals by conducting activities that foster individual and organizational learning and knowledge”.

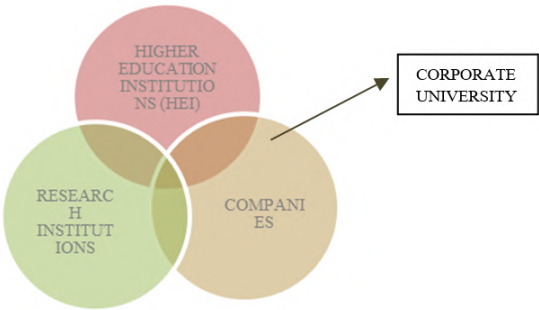


FIG. 4 - INTEGRATED KNOWLEDGE TRIANGLE REPRESENTATION - CORPORATE UNIVERSITY (ELABORATION BY THE AUTHORS)

In the intersection of the three circles, a strategic actor which offer all the analysed activities of the Knowledge Triangle can be identified: Professional Associations. This kind of organizations are founded and funded by businesses operating in specific industries. For they perform research and educational activities (together with others, e.g. advertising, political, publishing..) for their associates and for their strong relation with companies, their position in the KT should be considered as the core of the Knowledge Triangle.

Consequently, for a more realistic vision of the Logistics figure in the market, an integrated Knowledge Triangle Framework can be represented as in the following Figure.

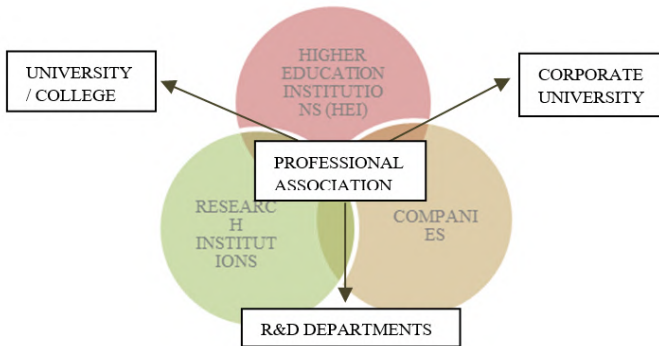


FIG. 5 - INTEGRATED KNOWLEDGE TRIANGLE REPRESENTATION
(ELABORATION BY THE AUTHORS)

After the definition of the Knowledge Triangle around Logistics, in the following paragraphs it will be illustrated criteria and indicators to evaluate the level of application of this framework, as developed in the borders of the FRAMELOG project.

2. Criteria and Indicators for evaluating the KT

2.1. Criteria

To evaluate the level of implementation of the Knowledge Triangle, a series of criteria and indicators has been set up. To operationalize the metrics, we decided to individuate two main dimensions: actor involved in the analysis and phase of daily activity.

Actors involved

Indicators has been set up according to the specific qualities of each actor of the extended version of the Knowledge Triangle. While for the basic three actors of the Triangle specific indicators have been created, for the other four actors the indicators developed are the combination of those selected for the first three, based on the qualities of the considered actor. In fact, as Universities are midway between HEI (A) and Research Institution (C), they are analysed with the indicators selected for those actors (A+C). Corporate University will be analysed, instead, with the combination of indicators used for HEI (A) and Companies (C) while Research&Development Department with the indicator used for the Research Institution (B) and Companies (C). The figure that can be analysed with all the three clusters of indicators is the professional association, for they perform educational and research activities and they present a strong link with Companies, for their associates are composed of economic entities. A summary of the used indicators is listed below:

1. Higher Education Institutions (Indicators "A")
2. Research Institutions (indicators "B")
3. Companies (indicators "C")
4. University & College (indicators "A+B")
5. R&D Departments (indicators "B+C")
6. Corporate University (indicators "A+C")
7. Professional Associations (indicators "A+B+C")
8. Phase of daily activity

Indicators has been ordered in different clusters, following the daily sequence of activity as presented in the Deming Wheel cycle, the so-cal-

led “PDCA” (Plan, Do, Check, Act). This is a four-step problem-solving iterative technique used to improve the quality of business processes. The PDCA Cycle can be used to effect both major performance improvements as well as small incremental improvements in projects and processes. The decision to utilize this scheme is based on the assumption that FRAMELOG is oriented to the improvement of the level of collaboration between the actors of the Knowledge Triangle.

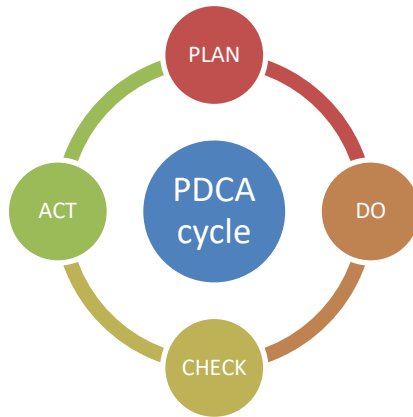


FIG. 6 - PDCA CYCLE - ELABORATION OF THE AUTHOR

2.2. Indicators

The PDCA scheme allowed to organize the different area of analysis for all the actors involved and to discover the connection points between them. For a higher clarity of exposition, a series of “Sub-Topics” has been selected inside each “Phase” of the PDCA cycle.

Connected to each “Sub-Topic”, firstly we analysed the major risk to which each actor was exposed in terms of collaboration between actors, to develop the most suitable indicator.

The “Act” Phase of the PDCA cycle has not been used in the developing of indicators, for it will be covered in the following modules of Output 2, when the selection of methods, instruments and guidelines for the improvement of the Knowledge Triangle will be presented.

A systemic summary of the analysed risks and the indicators selected to evaluate the level of collaboration between the actors of the Knowledge Triangle is presented in Table 1.

After the development of the presented indicators, they have been used to populate an online assessment tool dedicated for the assessment of the level of collaboration between the Knowledge Triangle actors.

TABLE 1 - INDICATORS IDENTIFIED FOR ASSESSING THE KNOWLEDGE TRIANGLE APPLICATION IN THE LOGISTIC AREA, ACCORDING TO THE PDCA CYCLE (ELABORATION BY THE AUTHORS)

	Sub Topic	Risk covered	Indicator	Actor
1 – PLAN	1.1 – Offer	Lack of educational offer specific on Logistics	Presence of courses or exams on Logistics	A
	1.2 -Structure	Lack of dedicated structure	Presence of dedicated staff for collaboration on didactic activities on logistic topics Presence of Research Centers on Logistics topics	A, B, C
	1.3 - Collaboration in Designing Courses	Contents/ Methods not aligned with company's needs	Presence of external contacts for selecting educational contents Presence of external contacts for defining educational programmes Presence of external contacts for choosing lecturers Presence of external contacts for selecting educational methods	A
	1.4 - Collaboration in The Governance	Lack of contacts with other stakeholder for relevant decision about the core activity	Presence of external contacts for the governance on Logistics	A, B, C
	1.5 - Innovation	Lack of use of innovative topics/ results/ trends	Presence of research activities/ topics in Logistics	A, B, C

2 - DO	2.1 -Conjoint Activities	Lack of activities carried out with other stakeholders	Presence of conjoint research projects, consultancies on Logistics	A, B, C
	2.2 - Dissemination Activities	Lack of dissemination activity	Presence of events on Logistics	A, B, C
	2.3 - Internship	Lack of connection between education institutions and workplace in terms of internship	Presence of coordination, offer of internships on Logistics	A, C
	2.4 - Thesis	Lack of connection between education institutions and workplace in terms of production	Presence of coordination, offer of thesis developed on Logistics	A, B, C
	2.5 – Visit	Lack of physical connection between education institutions and workplace	Presence of visits organized into facilities related to Logistics topics	A, B, C
	2.6 - Partnership	Lack of collaborations on Logistics	Presence of temporary and/or permanent partnerships on Logistics	A, B, C
	2.7 - Funding	Lack of sponsorships, funding on Logistics topics	Presence of PhDs, bourses, fellowships, professorial chairs on Logistics topics	A, B, C
3 - CHECK	3.1 – Check of educational requirements	Lack off effective collaboration between education and companies in terms of controls of educational requirements	Presence of controls on the alignment of the set of courses requirements with external partners on Logistics, at the end of the course	A
	3.2 - Employment	Lack of effective collaboration between education and companies in terms of employment	Presence of employments consequent to internships/projects on Logistics	A, B, C
	3.3 - Production	Lack of intellectual outputs on Logistics	Presence of production of intellectual outputs: papers, patents, software etc. on Logistics	A, B

TABLE 1 - INDICATORS FOR KNOWLEDGE TRIANGLE EVALUATION

3. FRAMELOG Self-assessment tool

Using the criteria and indicators identified and developed for assessing the level of collaboration among the key stakeholder of the Knowledge Triangle applied to the Logistic area, a self-assessment online tool has been developed by the authors. The developed assessment tool is meant to represent a reference tool for HEIs, research institutions and companies interested to collaborate for enhancing the quality and the relevance for the labour market of the academic programmes in this sector.

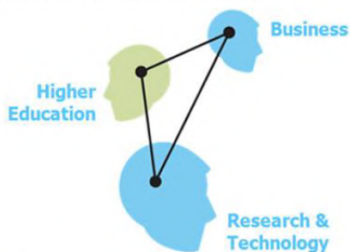
The assessment tool is realized with Limesurvey, an open-source tool for surveys, and is it accessible through a link available on the FRAMELOG website (<http://www.framealog.eu/results/>). The structure of the questionnaire is presented in details in the following paragraphs according to the presented list:

- I. Introduction of the questionnaire;
- II. Selection of user profile;
- III. Questions for the selected profile;
- IV. Conclusion.

3.1. Introduction of the questionnaire

In the introduction of the survey, a brief explanation of the main focus of the assessment is presented, which is to understand the level of collaboration between the users and their Partners of the Knowledge Triangle in the field of Logistics during the working activity processes. A specific privacy announcement guarantees the anonymity of the inserted answers to boost complete and accurate answers from respondents. In the following Figures, some extracts from Limesurvey are reported.

The Knowledge Triangle is a policy framework that stresses the need for an integrated approach towards research, innovation and education policies. Specifically, FRAMELOG aims at developing a common European framework for the logistic profession, which represent a strategic figure in the current industrial panorama. Basically, the three actors considered are: HEIs (High Education Institutions), Companies and Research Institutions.



The questions are organized according to the Deming Wheel scheme, which represents a systematic series of steps for gaining valuable learning and knowledge for the continual improvement of a product or process: PLAN, DO, CHECK, ACT.



In our questionnaire, you will find the "PLAN" area identified as "ACTIVITY PLANNING", "DO" as "PERFORMANCE" and CHECK as "CONTROL".

Fig. 7 - SELF-ASSESSMENT TOOL WELCOME PAGE (EXTRACT FROM LIMESURVEY)

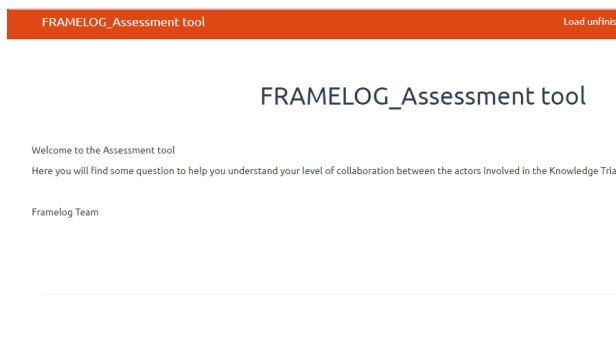


Fig. 8 - SELF-ASSESSMENT TOOL INTRODUCTION SESSION (EXTRACT FROM LIMESURVEY)

At the top of each section it will be explained which is the focus of the presented question, in order to guide you through the survey. At the end of the introduction section, an informative announcement shows that the survey will take maximum 1.30 hour, depending on the details the user would like to insert. Also, it is possible to save the already given answers and complete the questionnaire in several times.

3.2. Selection of user profile

As first activity, users are required to choose the profile that is more aligned to their organization, according to the explanation of the Integrated Knowledge Triangle. In particular, it is possible to select one of the profiles summarized in the following table.

Select your profile
1) HEI: Higher Education Institutions. They include institutions that offer higher education, which is the optional final stage of formal learning that occurs after completion of secondary education. Often delivered at universities, academies, colleges, seminaries, conservatories, and institutes of technology, higher education is also available through certain college-level institutions, including vocational schools, trade schools, and other career colleges that award academic degrees or professional certifications.
2) Company: a legal entity made up of an association of people, be they natural, legal, or a mixture of both, for carrying on a commercial or industrial enterprise. Company members share a common purpose and unite in order to focus their various talents and organize their collectively available skills or resources to achieve specific, declared goals.
3) Research Institution: an establishment endowed for doing research. Research institutes may specialize in basic research or may be oriented to applied research. Although the term often implies natural science research, there are also many research institutes in the social sciences as well, especially for sociological and historical research purposes.
4) University: any type of higher education institution which offers recognised degrees or other recognised tertiary level qualifications, irrespective of its denomination in the national context. The traditional university is an educational institution which grants both undergraduate and postgraduate degrees in a variety of subjects, as well as conducting original scientific research.

5) Corporate University: any educational entity that is a strategic tool designed to assist its parent organization in achieving its goals by conducting activities that foster individual and organizational learning and knowledge. A corporate university typically limits scope to providing job-specific, indeed company-specific, training for the managerial personnel of the parent corporation.
6) Professional Association: is usually a nonprofit organization seeking to further a particular profession, the interests of individuals engaged in that profession and the public interest. Many professional bodies are involved in the development and monitoring of professional educational programs, and the updating of skills, and thus perform professional certification to indicate that a person possesses qualifications in the subject area.
7) Research&Development Department: company department which performs activities in connection with corporate or government innovation. Research and development constitutes the first stage of development of a potential new service or product. R&D activities differ from institution to institution, with two primary models of an R&D department either staffed by engineers and tasked with directly developing new products, or staffed with industrial scientists and tasked with applied research in scientific or technological fields, which may facilitate future product development.

TABLE 2 - SELECTION OF USER PROFILE (ELABORATION BY THE AUTHORS)

After the selection of the profile, relevant information required for each user, according to their choice. In particular, for the Higher Educational Institution the number of yearly enrolled students on Logistic courses is required to be compared to the average number of students enrolled in other courses, as well as the courses in Logistics.

For Company and Research centers users, some essential information about the dimension of the company, turnover, business sector, job position of the filler and country of activities is requested, together with the indication of referred article(s) and/or active projects in Logistics developed in the organization. To guide the selection of the Business sector, a list of the 25 business sectors is presented to help the user identify the most appropriate one².

2. The Business sectors to be chosen among are the followings: 1. Mining and quarrying, 2. Food, beverages and tobacco, 3. Textile, clothing, leather and shoe production, 4. Wood and paper production, 5. Fuel processing and chemicals production, 6. Rubber

Moving to the Association, the requested information is focused on registration year, number of associates, kind of association and country in which they operate.

In the following tables, the specific information required is presented, according to the profiles.

User	Questions
HEI	Students per year (number), Students in Logistics per year (number), Courses (number), Courses in Logistics (number) – each data per average year and for the reference year
COMPANY/ RESEARCH CENTRE	Dimension of the Company (Small/medium enterprize: fewer than 250 persons employed; large enterprize: 250 or more persons employed), Turnover (last year), Business sector (inserted specific areas in “Note” on the buttom of the page), Job position of the filler, Country(ies) of activity; Referred article(s), Active project(s)
ASSOCIATION	Registration year, Associates (average number in the last five years), Kind of association (inserted specific areas in “Note” on the buttom of the page), Country

TABLE 3 - RELEVANT INFORMATION FOR SELF-ASSESSMENT TOOL RESPONDENTS (ELABORATION BY THE AUTHORS)

and plastics production, 7. Glass, ceramic, clay and cement production, 8. Metals and metal products, 9. Fabricated metal product manufacturing, 10. Electrical machinery and optical equipment production, 11. Transport equipment production, 12. Furniture, jewelry, musical instruments, sports goods, toy production, 13. Electricity, gas and steam production and distribution, 14. Water supply and recycling, 15. Construction, 16. Motor and fuel retail trade, 17. Wholesale trade, 18. Retail trade and repair 19. Hotel, restaurant and catering services, 20. Transport and storage, 21. Media and communications, 22. Real estate, renting and leasing, 23. Research and development sector, 24. Business services, 25. Financial and insurance sector.

3.3. Question for the selected profile

The logical pattern of questions in the assessment tool is presented in this section. In particular, the questions have been first developed referring to the three basic actors (HEIs/A, Companies/B, Research Centers/C). For the four additional actors inserted in the integrated Knowledge Triangle framework presented in the previous sections, the selected questions are the combination of the basic profiles of the three main actors. The following table shows the development of questions.

User	Questions
Hei	A
Company	B
Research Center	C
R&D Department	Selection of B+C
Corporate University	Selection of A+B
University	Selection of A+C
Professional Association	Selection of A+B+C

Combination of questions,
for the co-presence of
different activities

TABLE 4 - COMBINATION OF SELF-ASSESSMENT TOOL QUESTIONS
ACCORDING TO THE PROFILE (ELABORATION BY THE AUTHORS)

In Annex I, the FRAMELOG Self-assessment articulated structure is presented, highlighting the

1. **Indicator:** Present the aspects assessed related to the risk reported in column 5;
2. **Actor involved:** present the actor who the question is referred to;
3. **Phase of activity flow:** Present the analysed stage of the PDCA Cycle (*NB: the "ACT" phase is represented by the developed methods and guidelines, aimed at suggesting organizations possible directions in the development of activities related to each indicator*)
4. **Sub-topic:** Displays the sub-areas in which the previous mentioned phase has been structured
5. **Risk:** Clarifies the potential risk connected to each sub-area of the analysed phase

- 6. FRAMELOG Assessment tool possible result:** Presents the results that could be detected in the tool

For each question, several additional qualitative specifications could be spontaneously inserted by user.

3.4. Conclusion

After having inserted the answer to each of the sections of the questionnaire, users receive a message of thanks and have the possibility to download a report in two different formats (.xls, .pdf). In the report, user can visualize a summary of their answers and are invited to access the FRAMELOG website to surf and/or download the Guidelines for helping an effective implementation of the FRAMELOG (http://www.framehog.eu/wp-content/uploads/2016/10/O2A4-Guidelines_final-document.pdf).

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Annex 1

FRAMELOG Assessment tool structure (elaboration by the Authors)

1. Plan

1	2	3	4	5	6
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	FRAMELOG Assessment tool possible result
I) Presence of courses or exams on Logistics	A	1-PLAN	1.1 – Educational offer	Lack of educational offer specific on Logistics	No courses Some courses (just Bachelor or Master or professionals) Yes, all levels
II) Presence of dedicated staff for collaboration on didactic activities on logistic topics	A, B, C		1.2 -Structure	Lack of dedicated structure	No Yes No Yes
III) Presence of Research centers on Logistics	A, B, C				
IV) Presence of external contacts for selecting educational contents	A				No Yes
V) Presence of external contacts for defining educational programmes	A		1.3 – Collaboration in Designing Courses	Contents/ Methods not aligned with company's needs	No Yes No Yes No Yes
VI) Presence of external contacts for choosing lecturers	A				
VII) Presence of external contacts for selecting educational methods	A				No Yes
VIII) Presence of external contacts for the governance on Logistics	A, B, C		1.4 - Collaboration in The Governance	Lack of contacts with other stakeholder for relevant decision about the core activity	No Yes
IX) Presence of research activities/ topics in Logistics	A, B, C		1.5 - Innovation	Lack of use of innovative topics/ results/ trends	No Yes

2. Do/ Performance

1	2	3	4	5	6
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	FRAMELOG Assessment tool possible result
X) Presence of conjoint research projects, consultancies on Logistics	A, B, C	2 - DO	2.1 -Conjoint Activities	Lack of activities carried out with other stakeholders	No
					Yes
XI) Presence of events on Logistics	A, B, C		2.2-Dissemination Activities	Lack of dissemination activity	No
					Yes
XII) Presence of coordination, offer of internships on Logistics	A, C		2.3 - Internship	Lack of connection between education institutions and workplace in terms of internship	No
					Yes
XIII) Presence of coordination, offer of thesis developed on Logistics	A, B, C		2.4 - Thesis	Lack of connection between education institutions and workplace in terms of production	No
					Yes
XIV) Presence of visits organized into facilities related to Logistics topics	A, B, C		2.5 – Visit	Lack of physical connection between education institutions and workplace	No
					Yes
XV) Presence of temporary and/or permanent partnerships on Logistics	A, B, C		2.6 - Partnership	Lack of collaborations on Logistics	No
					Yes, but only temporary or permanent
					Yes
XVI) Presence of PhDs, bourses, fellowships, professorial chairs on Logistics topics	A, B, C		2.7 - Funding	Lack of sponsorships, funding on Logistics topics	No
					Yes, but only some kind of sponsorship/ funding
					Yes, all of them

3. Check

1	2	3	4	5	6	
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	FRAMELOG Assessment tool possible result	
XVII) Presence of controls on the alignment of the set of courses requirements with external partners on Logistics, at the end of the course	A	3 - CHECK	3.1 – Check of educational requirements	Lack off effective collaboration between education and companies in terms of controls of educational requirements	No	
					Yes	
XVIII) Presence of employments consequent to internships/projects on Logistics	A, B, C		3.2 - Employment	Lack of effective collaboration between education and companies in terms of employment	No	
					Yes	
XIX) Presence of production of intellectual outputs: papers, patents, software etc. on Logistics	A, B		3.3 - Production	Lack of intellectual outputs on Logistics	No	
					Yes	

METHODS AND INSTRUMENTS FOR ENHANCING THE KNOWLEDGE TRIANGLE FRAMEWORK APPLICATION

Dott. Scipioni Sara, University of Pisa

Prof. Giannini Marco, University of Pisa



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1. Introduction

The professional profiles in the field of Logistics, as well as the concept and the architecture of Logistics itself, have been changing throughout the years. The role of Logistics is nowadays more complex and strategic in every kind of organizations, as it connects physical, information and financial flows in one common value chain. New big challenges must be faced in every strategy that involves the logistic activities and need to be seriously addressed. Just think - as a mere example - in the era of the Internet of Things and of Industry 4.0 to the threat of cyber-piracy or to the opportunity of “big data” that are increasingly affecting also logistic processes. Increasing E and M-commerce trends, city mobility needs or 3D printing opportunities are just few examples of other emerging socio-economic trends to be urgently considered in the academic qualification, in order to offer a quality training to students and professionals and reduce the shortage of competent staff in companies.

Consequently, the competences required by the professionals are continuously changing and need to be continuously updated. Technical and managerial skills are taught all over Europe inside the organizations and the different training activities require always more detailed planning and offer. For this reason, the presence of a qualification system of professionals in Logistics has to be evaluated and highlighted.

One of the main challenge for obtaining a sustainable competitive advantage at national or European level in this new context of Logistics is to compare the hard and soft competences required to professionals to effectively work in this sector and the “core competences” that academic courses offer to students.

Also, contents and methods for students’ education should be designed to make students ready to face the workplaces and to develop both specialized and horizontal competences. Specialized competences refer primarily to hard and technical skills, including with juridical, managerial, marketing, organizational ones. Transversal competences or “soft skills” are a set of intangible personal qualities, traits, attributes, habits and attitudes that can be used in different types of jobs. As they are broadly applicable they are also seen as partially (depending from the contexts) transferable skills. Examples of soft skills include: leadership,

self-management, motivation, flexibility, sociability, time management and decision making, and other related to teamwork, problem-solving and networking.

The quality and the continuous updating of academic programs in the sector, the engagement of the stakeholders, the transparent communication on the concrete roles are - for their nature - key elements for facilitating the concrete and efficient implementation of the Knowledge Triangle approach. As a matter of fact, the investment on these three “leverage” areas – Education, Research and Industry - can activate a productive circle or spiral of “knowledge circulation”, that can invest and create benefit in the logistic activities, and consequently also in the industrial sector, at European level.

Within this context, this report provides an organic and systemic framework of methods, instruments and actions that can structurally and permanently reinforce the Knowledge Triangle in the logistics field, in order to improve academic qualifications. The present framework is directly connected and introduces methodologically and structurally, the subsequent output of the project related to the *Stakeholder engagement plan*. Within the proposed framework, a set of methods and instruments will also be highlighted in order to facilitate communication between the knowledge triangle key actors, with a view on the contribution to the continuous updating and improvement of academic qualifications in the field of the logistic.

2. Structure

Moving from the indicators and the whole Assessment tool previously implemented (O2 A1), also this analysis used the so called “PDCA” (Plan, Do, Check, Act) method to guide the development of the most suitable “Methods and Instruments” for the efficient communication of the Knowledge Triangle for academic qualifications. This approach underlines the need of continuous improvement and learning in a functional, product or process oriented perspective.

In this context, the PDCA method has been used here as framework for the identification, design, development and assessment of “logistic centered” academic didactic offer carried out by a Higher Educational

Institution. Also, the results of the Compendium of Good Practices have been considered to orient methods and instruments aligned to the benchmark realities in this sector.

In particular, the **“Plan”** phase includes the core planning activities of an academic course, meaning a variety of activities that goes from the selection of contents of the course, through the choice of the most effective educational method, to the identification of the knowledge and of the core competences that will be gained by the students and to the planning of the support structure of the activities. It is the first point of the cycle as it regards also the periodical revision, evaluation and development of the educational course and methods and instruments should be aligned to the most innovative ones developed in the good practices.

As the **“Do”** phase summarizes the core of the HEI’s activity, the methods and instruments presented in the next paragraphs of this document should help the decision makers to reach an effective combination of tools to meet those professional needs and requirements in terms of skills and knowledge set up in the previous phase. For example, a series of possible dissemination and research activities which can enhance the connection between the three actors of the Knowledge Triangle is presented.

In the **“Check”** phase, the focus is moved to the result’controls of the previous phases: methods and instruments, in this section, are presented to support this process in finding potential gaps to be filled up and/or to evaluate if the level of the activities has really met the standards set upstream. This represents a crucial point in the improvement process since it reveals the real demands in terms of quality and effectiveness.

The **“Act”** phase will be developed in the O2A4 “Guidelines”, as they will show in detail the steps to enhance the collaboration between the three points of the Knowledge Triangle, therefore representing the possible improvements to be foreseen before restarting the PDCA Cycle.

3. Methods and Instruments

This section presents a proposal of a systemic framework of useful methods and instruments, as to implement ‘knowledge triangle’ approach against the criteria and indicators set up within this project (see O2

A1), with the main scope of enhancing the ‘knowledge triangle’ communication for academic qualifications. Some actions will be also illustrated, in order to methodologically connect this Project’s output with the following Stakeholder engagement plan (O2 A3).

The framework for the identification of these methods, instruments and actions has been created moving from the Good practices of HEIs in Logistics and doing some brainstorming sessions between authors and contributors to the document. All the methods and instruments are arranged in sections that recall the previously explained phases of the PDCA Cycle.

A table, offering a systemic framework of the methods and instruments proposed enhance the communication of the Knowledge triangle for academic qualifications is attached under “I”.

The table is composed of seven columns. The first three columns are directly connected to the assessment tool structure: the first one “Phase” presents the analysed stage of the PDCA Cycle, the second one “Sub Topic” displays the sub-areas in which the previous mentioned phase has been structured; the “Risk” column clarifies the potential risk connected to each sub-area of the analysed phase.

Phase	Sub Topic	Risk

TABLE 1 - FIRST THREE COLUMNS OF ATTACHMENT “I”

The fourth and fifth columns summarize the activity of the assessment tool. Indeed, the first one “Assessment tool analysed aspect” presents the aspects assessed related to the previously presented risk and the other one, “Assessment tool possible result”, the results that could be detected in the tool.

Aspect analysed in the Assessment tool	Assessment tool possible result

TABLE 2 - FOURTH AND FIFTH COLUMNS OF ATTACHMENT “I”

The last two columns report the synthesis of those “Methods”, “Instruments and actions” that have been identified to fill the possible gaps between the actual situation of the respondent and the best practice, detailed per single risk.

Methods	Instruments and actions

TABLE 3 - LAST TWO COLUMNS OF ATTACHMENT “I”.

3.1. *Plan*

The methods and Instruments presented in the “Plan” part of “Annex I” listed under points **1.1** “Offer” and **1.2** “Structure” could be considered mainly as general indications. They concern the development of internal academic courses and structures that may vary in different entities, while in the other sections they must be considered as possible solutions for enhancing the level of cooperation of the three actors of the Knowledge Triangle.

The core planning methods and instruments are presented on point 1.3: the planning of academic contents, programmes and educational methods in a collaborative way between the three actors of the Knowledge Triangle are fundamental to align the academic offers to the industry’ needs. In particular, the provision of meetings in which business and academic experts can debate about the most relevant contents on Logistics or the most effective educational methods (e.g. interactive games, industry software experiencing) to be used for students is considered as necessary for the effective implementation of the Knowledge Triangle.

The key method, once the basic ones have been developed, is the **accreditation** of the academic course, seen as a concrete instrument for enhancing the academic qualifications throughout the European countries. In the “Annex I” at point **1.3** an analysis of the mentioned instruments is presented. Another useful instrument is an innovative tool based on the ‘EntreComp’, the Entrepreneurship Competences Framework structure and logics, the most important competences related

to the Logistics field could be identified, including both hard and soft skills. This “**competences tracking tool**” is here named “**LogiComp**”. Moreover, the mapped skills are based on both the Framework of Competences developed by ELA which mainly identifies the technical skills (Core Management Skills, Project and Change Management, Process Management, Demand, Production and Distribution Requirements Planning, Warehousing, Transportation, Sourcing, Customer service) and the findings of the World Bank study which identified a lack of soft - personal, communication, decision-making & problem-solving, leadership - skills in qualified administrative staff, supervisors and managers. As other instrument, A **self-assessment tool** could be developed for universities in order to identify the gaps in their curricula compared to the ELA standards and the LogiComp. The universities would receive at the end a diagram of modules/standards/skills where they would need to improve and/or adjust their curricula. Also, a **template** for the description of **relevant case studies** in Logistics that could also be adopted by Universities and implemented into curriculum design.

At the end of this area, in 1.4 are listed some indications regarding the “Collaboration in the Governance”, which is an important way to introduce opportunities to the management of an HEI, since governance oversees all the strategic decisions of the entity. The development of a **Strategic Committee** comprised of academic Directors and representatives of the key players of the territory in which the HEI is located and the national authorities, with consultancy powers only, would help in the development of new courses or collaborations between the three actors. A final focus on instruments for developing research activities with the cooperation of HEIs, Research Institutions and Companies is reported in 1.5 “Innovation”.

3.2. *Do*

Moving to the “Do” phase, several instruments can be provided to enhance the effective collaboration between the three actors of the Knowledge Triangle. Talking about the 2.1 “Conjoint activities”, the development of research projects and intellectual outputs as the provision of seminars and dissemination activities will create contact points

between the actors and improve the opportunity of collaborations. A similar analysis will be found in 2.2 “Dissemination activities”.

In this section, the main interest is on 2.3 and 2.4, for their regard on “Internship” and “Thesis”: for the planning of this kind of activities in collaboration with the three actors of the Knowledge Triangle is essential to create the opportunity for students to connect to the market. Some instruments for the involvement of Partners, management of activities and review of results are presented. Related to this perspective, point 2.5 focuses on the necessity of real contacts between students and the three actors, with the suggestion of organizing visits to business and research venues.

Points 2.6 and 2.7 regard “Partnership” and “Funding” which are essential to be overseen to enable the opportunity of developing common activities and projects and therefore the collaboration. For example, the funding of bourses, PhDs and fellowships are considered as a preparatory step of students’ employment, then for Companies should be strategic to provide HEIs with specific funds to train potential future workforces for their own entities.

3.3. *Check*

This part focuses on suggestions for improving the collaboration in stage of the activities, which is the most strategic stage in the PDCA Cycle for it normally raises weaknesses and gaps between the expected results and the real ones. Here, the cooperation of the three actors of the Knowledge Triangle has to be considered as essential to face and solve those deficiencies in the most efficient way for the market and the implementation of the Knowledge Triangle itself.

As in the “Plan” phase, also in the “Check” one the presence of business experts and researcher will give an useful external view in reviewing the educational requirements to adapt them to the current trends, as presented in 3.1 “Check of educational requirements”. The main focus, however, is presented at point 3.2, “Employment” where the collaboration is necessary to help orienting the HEIs’ activities for enhancing the students’ possibility of employment. That would be possible debating about the most

effective scheme of collaboration between the actors, such as internships schemes in which employment is guaranteed (e.g. Budapest Metropolitan University scheme or the NOVUS scheme in Huddersfield). This aspect is strictly related to the last section of methods and instruments, 3.3 “Production”: also here, the connection between the three actors of the Knowledge Triangle should lead to the creation of a positive environment that could enable the production of intellectual outputs, such as papers and patents focused on the Logistics areas.

4. Next steps

In this document, the framework of the most relevant ways in which the Knowledge Triangle focused on Logistics has been developed, by bringing together the contents collected in the Compendium of Good Practices developed in the O1 and the experience of experts from the different actors of the Triangle considered.

Following this document, in O2A3 an Engagement Plan for the presented instruments and related activities will be introduced and will clarify the figures to be responsible for them. For an in-depth analysis of the suggested procedure to enhance the implementation of an effective Knowledge Triangle, the O2A4 will present the Guidelines that will orient the stakeholders’ activities and lead to the best practices on the collaboration framework on Logistics.

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Attachment I

Systemic summary of the main methods and instruments to enhance the communication of the triangle for academic qualifications

Phase	Sub Topic	Risk	Aspect analysed in the Assessment tool	Assessment tool possible result	Methods	Instruments and possible actions
1 – PLAN	1.1 - Offer	Lack of educational offer specific on Logistics	Presence of courses or exams on Logistics	No courses	Development of specific courses or at several levels (Bachelor, Master, professional) focused on Logistics, based on the needs and potentialities of the entity	Analysis of specific needs of the territory in terms of Logistics courses/exam and analysis of the potentialities of creation of courses/exams Proposal of courses focused on Logistics during official meetings for the periodical (usually annual or biennial) course planning. Proposal to local/ national key players on Logistics (e.g. Port/Airport Authorities) or Trade Associations of co-financing of courses on Logistics. Creation of a "Strategic Committee" comprised of the above-mentioned figures, with consultative powers.
				Some courses (just Bachelor or Master or professionals)	Development of specific courses or exams at the missing level	Proposal of courses focused on Logistics during official meetings for the periodical (annual...) course planning
				Yes, all levels	Analysis of the contents and educational methods used	See sub topic 3
	1.2 -Structure	Lack of dedicated structure	Presence of dedicated staff for collaboration on didactic activities on logistic topics	No	Identification of a reference person in the most suitable administrative office who will be in charge to take care of active collaborations with external partners about didactic activities on logistic topics	Analysis of the staff chart and selection of a unit and a position where the role/responsibility for didactic activities in the logistic field can be assigned. The diplomacy and organizational competence will be considered as fundamental requirements
				Yes	Analysis of the existing staff and of their functions	Analysis of the most efficient profile in terms of management of collaboration with external partners from good practices and self-assessment
		Lack of dedicated structure	Presence of Research centers on Logistics	No	Evaluation of the opportunity to create a research center (1) or the activation of a collaboration with an existing one (2)	Start of the process of creation of a Research Center: search of possible Partners for financial and scientific support with a proposal of governance and activities inspired to the best practices Proposal to local/ national key players on Logistics (e.g. Port/Airport Authorities) or Trade Associations of co-financing of the research center on Logistics. Activation of collaborations: Search of possible Partners for activating a first a temporary collaboration, with the perspective of an enduring one.
				Yes	Analysis of the activities offered/ planned in the Center – analysis of the organizational structure – analysis of the active collaborations	Using the Good practices, analyse the alignment of the activities of the Center in terms of innovation, effectiveness, diffusion of the results. Assessment of the governance: the Center should be participated by different actors to reach completeness. Evaluation of active collaborations: consider the profile of Partners and the ones presented in the best practice to evaluate an enlargement
	1.3 - Collaboration in Designing Courses	Contents/ Methods not aligned with company's needs	Presence of external contacts for selecting educational contents	No	Plan to include experts from the industry, Research institutes and (when absent) lecturers of different fields (e.g. Engineering, Economy, Informatic, Law) in the meetings in which the courses are designed	In respect of the national standards required, selection of contents using: topics considered essential by the industry the last innovative results achieved by ad-hoc research institutions The Good practice will also help in guiding the balance of the different needs.
				Yes	Review of the contents (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of contents based on the best practices' ones and (2) starting the accreditation process for the course with the alignment of the required elements.

Phase	Sub Topic	Risk	Aspect analysed in the Assessment tool	Assessment tool possible result	Methods	Instruments and possible actions
			Presence of external contacts for defining educational programmes	No	Plan to include experts from the industry, Research institutes and (when absent) lecturers of different fields (e.g. Engineering, Economy, Informatic, Law) in the meetings in which the programmes are designed	At the official meetings of Didactic Councils, proposal of participation of experts from the Logistics area and researchers to debate about the proposed programme of courses/exams on Logistics. Guidelines to lecturers to guide the definition of programmes: contents needed are mostly the currently required topics from Companies, the last trends and findings of Research centers and the LogiComp, the "competences tracking tool" that identified the most important competences related to the Logistic field.
				Yes	Review of the programmes (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of programmes based on the best practices' ones and (2) starting the accreditation process for the course with the alignment of the required elements.
			Presence of external contacts for choosing lecturers	No	Plan to include experts from the industry, researchers from Research institutes and lecturers of different fields (e.g. Engineering, Economy, Informatic, Law) as lecturers	Lectures should be mixed as presented: Internal and guest professors (national/ international) Guest experts from Business (national/ international) Partners/ Alumni (in research/ business topics)
				Yes	Review of the selected lecturers (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of the selected lectures based on the best practices' ones and (2) starting the accreditation process for the course with the alignment of the required elements.
			Presence of external contacts for selecting educational methods	No	Plan to include experts from the industry, researchers from Research institutes and lecturers of different fields (e.g. Engineering, Economy, Informatic, Law) in the meetings in which the methods are selected	The most efficient methods, to be used, from the analysed good practices for methods are the following: Innovative teaching methods: case studies, projects, industry specific software experiencing, simulations, interactive games Intensive Alumni interactions
				Yes	Review of the methods (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of methods based on the best practices' ones and (2) starting the accreditation process for the course with the alignment of the required elements.
	1.4 - Collaboration in The Governance	Lack of contacts with other stakeholder for relevant decision about the core activity	Presence of external contacts for the governance on Logistics	No	Inclusion of business experts and researchers in the governance body	Creation of ad-hoc Strategic Committee with key players on Logistics to advise and consult about opportunities of collaborations, courses, exams. In respect of the institution structure, the powers assigned to the Committee could be different.
				Yes	Check of the structure adopted (see above)	Check of the structure adopted (see above)
	1.5 - Innovation	Lack of use of innovative topics/ results/ trends	Presence of research activities/ topics in Logistics	No	Develop of research activities on Logistics	Prevision of development of research projects on Logistics inside the course, using a compendium of last research achievements and trends in parallel to the course contents
					Check of the structure adopted (see above)	Check the instruments (see above)
2 - DO	2.1 - Conjoint Activities	Lack of activities carried out with other stakeholders	Presence of conjoint research projects, consultancies on Logistics	No	Develop of conjoint activities with business and research entities, such as: Research projects with students Production of intellectual outputs (papers, articles, patents) Seminars	Guidelines for development of Research projects with students/ Production of intellectual outputs (papers, articles): selection of companies for the development of specific projects on Logistics based on their field of activity and/or selection of Research Institutions; contract with the chosen Partner and selection of graduates/students to assign to the project; tutoring and review of the production from academic lecturers; dissemination of results. Guidelines for development of seminars: selection of business and/or research representative for specific seminars on Logistic topics presented during courses and innovative trends in the market; event management (finding of budget, selection of possible dates/ venues/ duration, booking and marketing)

Phase	Sub Topic	Risk	Aspect analysed in the Assessment tool	Assessment tool possible result	Methods	Instruments and possible actions
				Yes	Check of the activities carried out (see above)	Assessment of the effectiveness of the activities carried out in terms of diffusion of contents, employment of students, innovation reached. Consider extending and/or selecting activities
	2.2 - Dissemination Activities	Lack of dissemination activity	Presence of events on Logistics	No	Organization of events to disseminate results on Logistics, from both internal and external projects	Guidelines for selection of business and/or research representative for specific seminars on Logistic topics presented during courses and innovative trends in the market; event management (finding of budget, selection of possible dates/ venues/ duration, booking and marketing).
				Yes	Check of the activities carried out (see above)	Assess of the effectiveness of the activities carried out in terms of diffusion of contents, number and kind of participants, frequency. Consider extending and/or selecting activities
	2.3 - Internship	Lack of connection between education institutions and workplace in terms of internship	Presence of coordination, offer of internships on Logistics	No	Coordination and/or offer of internships focused on Logistics	Guidelines for Coordination: involvement of external Partners (from business/research), promotion towards students of the possibility of internships on Logistics topics at the Partner's premises, administrative arrangements, providing of tutoring before/during/after internship, monitoring of results of the activity (employment, intellectual outputs) Guidelines for Offer: promotion towards students of the possibility of internships on Logistics topics in the HEI's facilities (Research centres, e.g.), administrative arrangements, providing of tutoring before/during/after internship, monitoring of results of the activity (employment, intellectual outputs)
				Yes	Check of the internships organized (see above)	Assess of the effectiveness of the activities carried out in terms of intellectual output produces, employment/ collaborations developed
	2.4 - Thesis	Lack of connection between education institutions and workplace in terms of production	Presence of coordination, offer of thesis developed on Logistics	No	Coordination and/or offer of Thesis focused on Logistics	Guidelines for collaboration: involvement of external Partners (from business/research), promotion towards students of the possibility of thesis on Logistics topics with the selected Partners, administrative arrangements, providing of tutoring, monitoring of results of the activity (innovative contents, effectiveness of solutions proposed) Guidelines for Offer: promotion towards students of the possibility of thesis on Logistics topics, administrative arrangements, providing of tutoring before/during thesis, monitoring of results of the activity (innovative contents, effectiveness of solutions proposed)
				Yes	Check the quality of thesis developed by the HEI's graduates	Assess the quality of the already developed thesis in term of: innovation of contents (in case of research thesis) effectiveness of solutions proposed (if developed with /for a company) Consider orienting the future thesis on the most innovative trends on Logistics and to the development of innovative solutions for companies.
	2.5 - Visit	Lack of physical connection between education institutions and workplace	Presence of visits organized into facilities related to Logistics topics	No	Development of periodic visits to companies and research centres for analysing Logistics facilities/ equipment/ software	Guidelines for collaboration: involvement of external Partners (from business/research), promotion towards students of the possibility of visits for analysing Logistics facilities/ equipment/ software; administrative arrangements; event management (finding of budget, selection of possible dates, logistics); dissemination activity of the event.
				Yes	Check of the quality of visits organized	Assess of the effectiveness of the visits carried out in terms of number of participants, frequency, spin-offs (development of thesis, collaborations, internships). Consider extending and/or selecting visits.
	2.6 - Partnership	Lack of collaborations on Logistics	Presence of temporary and/or permanent partnerships on Logistics	No	Develop temporary and permanent collaborations on Logistics	Guidelines for collaboration: selection of external Partners (from business/research), proposal of projects to be developed together to give value to the collaboration, discussion on the expected results of collaboration, administrative management. Consider developing: temporary collaboration as first step permanent collaboration after the good outcome of the first one or with already known Partners
				Yes, but only temporary or permanent	Check of the quality of Partners with active collaborations on Logistics and consider developing new ones	See above for the development of the missing one

Phase	Sub Topic	Risk	Aspect analysed in the Assessment tool	Assessment tool possible result	Methods	Instruments and possible actions
				Yes	Check of the quality of Partners with active collaborations on Logistics	Assess of the effectiveness of the active collaborations carried out in terms of number of projects, frequency, spin-offs (development of thesis, internships, student employments). Consider extending and/or selecting collaborations.
	2.7 - Funding	Lack of sponsorships, funding on Logistics topics	Presence of PhDs, bourses, fellowships, professorial chairs on Logistics topics	No	Develop a framework of sponsorships and funding for Logistics are	Consider developing the following sponsorships, to enhance the collaboration of the Triangle: PhD Bourses Fellowships Professional chairs
				Yes, but only some kind of sponsorship/funding	Check of the quality of actual sponsorships and funding on Logistics and consider developing new ones	See above for the development of the missing one/s
				Yes, all of them	Check of the quality of actual sponsorships and funding on Logistics	Assess of the effectiveness of the active sponsorships and funding in terms of number of students reached, frequency, spin-offs (development of thesis, internships, student employments). Consider extending and/or selecting collaborations.
3 - CHECK	3.1 – Check of educational requirements	Lack off effective collaboration between education and companies in terms of controls of educational requirements	Presence of controls on the alignment of the set of courses requirements with external partners on Logistics, at the end of the course	No	Develop of controls on the alignment of course results respectful of the initial requirements with the co-presence of experts from business and research	Implement a double check of initial requirements and final results of the course/exam about: Course/exam contents, in terms of completeness and research material; Educational method used, in terms of effectiveness; Programmes developed, in terms of workload and usefulness. Consider developing a survey for students about the evaluation of the previously mentioned aspects.
				Yes	Review of the selected controls (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of the controls activated based on the best practices' ones and (2) starting the accreditation process for the course with the alignment of the required elements.
	3.2 - Employment	Lack of effective collaboration between education and companies in terms of employment	Presence of employments consequent to internships/projects on Logistics	No	Promote employment to Companies in the Logistics areas	Develop of a framework of activities which will enable a higher number of internships in the Logistics areas, using the Compendium of Good practices. Here some examples: Agreement with Companies for developing dual programs (university courses with elements of professional training or work experience) and sandwich courses (educational course integrated with period of work); Developing internships schemes in which employment is guaranteed (e.g. Budapest Metropolitan University scheme or the NOVUS scheme in Huddersfield); Creation a virtual job search platform specialized in logistics positions; Organizing job fairs with Companies.
				Yes	(1) Check the percentage of employment up to the total number and (2) consider some strategies to increase it	(1) Check the effectiveness of the activities activated, (2) consider increasing activities (see above).
	3.3 - Production	Lack of intellectual outputs on Logistics	Presence of production of intellectual outputs: papers, patents, software etc. on Logistics	No	Promote collaboration to Companies and Research Institutions in the Logistics areas with the scope of developing intellectual outputs	Develop of a framework of activities which will enable an opportunity of co-development of intellectual outputs in the Logistics areas: Agreement with Companies and Research Centers for developing research project/ thesis/ PhDs projects oriented to the creation of software/ drafting of papers; Creation a virtual research platform specialized in collect proposals of articles, papers; Organizing job fairs with Companies and Research Centers to stimulate the cooperation.
				Yes	(1) Check of the production coming from the active collaborations and (2) consider some strategies to increase it	(1) Check the effectiveness of the active collaborations and production, (2) consider increasing activities (see above).

FRAMELOG STAKEHOLDERS' ENGAGEMENT PLAN

Dott. Scipioni Sara, University of Pisa

Dott. Gaiotto Beatrice, University of Pisa

Prof. Niccolini Federico, University of Pisa

Prof. Giannini Marco, University of Pisa



For this chapter, we acknowledge the contributions provided by Kamelia Stefanova, UNWE, Dorina Kabachieva, UNWE Cristina Nicolau, UTBv.

1. Introduction

Organizations need to remain competitive to survive in a challenging business environment and competitiveness requires regular interaction with important stakeholder groups. A robust stakeholder engagement model is vital for universities and research institutions to be able to understand and respond to environmental concerns.

In this regard, the “stakeholder engagement” can be described as the practice of interacting and influencing project stakeholders to the overall benefit of the project and its delegates, in order to maximize their chances of success. The successful completion of a project usually depends on how the stakeholders view it.

The idea of engagement assumes a significant importance at the communicative level if you consider that the meaning of *Engagement* belongs to the interactive communication. It is a substantive which means *involvement* and simultaneously refers to the idea of taking care of the partners with whom relation has been established.

In many fields, stakeholder engagement plays a key role for the project's success: in fact, since people deliver outputs and perform activities in an effective way only if they have a real interest in the project, the project manager has to rely on the engagement process to achieve the expected objectives. In this perspective, the relationship care assumes a significant role: where there is engagement and collaboration, people work more efficiently and pleasantly: building relationship with selected stakeholders will increase confidence in the business environment by speeding up problem solving and stakeholders effectiveness.

Stakeholder Engagement implies a long-term relationship with active involvement and influence among the subjects engaged in the company organization, same organization that needs to be monitored and programmed in detail, to improve its effectiveness and business efficiency.

Precisely, this type of monitoring can be managed with tools from the logistics sector, which is defined as a set of organizational, management and strategic activities that govern information company flows'. Specifically, the company logistics is dedicated to the connection, in

terms of optimization, effectiveness and efficiency, of some phases of the production process in which it is important to manage the flows to define the strategies to be adopted in the business activity.

The stakeholder engagement should be implemented by a delivery system, known as Stakeholder Engagement Plan, which should assist the actors involved and interested in the project during the various activities that will be implemented to manage or enhance engagement.

Freeman (1984) defines a stakeholder as *'any group or individual who can affect or is affected by the achievement of the organization's objectives'*. The definition of a stakeholder, the purpose and the character of the organization and the role of managers are very unclear and contested in literature and have changed over the years. Even the "father of the stakeholder concept" changed his definition over the time. In one of his latest definitions, Freeman (2004) identifies stakeholders as "those groups who are vital to the survival and success of the corporation" adding a new principle, which reflects a new trend in stakeholder theory. In this principle in his opinion the consideration of the perspective of the stakeholders themselves and their activities is also very important to be taken into the management of companies. He states "The principle of stakeholder recourse. Stakeholders may bring an action against the directors for failure to perform the required duty of care" (Freeman, 2004). Therefore, an organization can influence or be influenced by the actions of the stakeholders. Some of those subjects who play a direct role for the organization can be identified in investors, employees and customers, even though nowadays the modern theory recognizes within the stakeholders' group other subjects with an external role respectful to the specific organization, such as trade associations, government bodies and local communities.

After having analysed the definition of the stakeholder engagement concept, it is interesting to understand which are the benefits strictly connected to its use. It's clear from the introduction that being in an active dialogue with stakeholders would help companies to anticipate environmental issues, and consequently being part of the conversation allows companies to be a part of the solution and reduces the risk of conflicts. Whenever stakeholders are involved among them, their en-

gement will help others to understand their need and expectations towards the company. All this will allow establishing greater and solid relationship between internal and external resources removing cultural and language barriers.

In our specific case, the strength of the engagement plan is to be able to link the main actors who are part of the knowledge triangle: the engagement plan must connect different areas of interest, combining and informing them to such an extent that, once involved, they can understand if they will have positive or negative effects from the cycle.

The purpose of this document is to identify the importance of the stakeholder engagement in general and, specifically, the role covered into the logistic field. We started to define the stakeholder figure and the communication strategy adapted in the organization's environment. Subsequently our study will move to the analysis of the stakeholders, how they have been selected and the identification model used from the experts.

Finally, we will focus on the results we expect to achieve, focusing on the key-players and relevant analysis.

The aim of the plan is to frame the role of the key players towards the knowledge triangle and its effect on them.

2. Stakeholders analysis

The analysis of the stakeholders at a general level, invites to reflect on the stakeholders' groups who influence or are influenced by the organization activities of the relative area. It's clear that the analysis will underline different categories of stakeholders; each one characterized by different procedures and involvement levels.

A relevant aspect for stakeholder analysis is given by the ability to influence and the interest level the stakeholders express. It can be used to generate knowledge about the relevant actors so as to understand their behaviors, intentions, interrelations, agendas, interests, and the influence or resources they have brought – or could bring – to bear on decision-making processes.

On the other hand, the analysis is strongly linked to the engagement idea: it is a method used to identify the way in which stakeholders can

influence the organization or can be influenced by its activities, as well as their attitude towards the organization and its targets.

Individuals or groups can be identified in specific circumstances. Some individuals may be part of multiple stakeholder groups, and then it is important to point out the distinction between two different types of Stakeholders, which can be internal or external.

Internal stakeholders are those group or individuals who have an interest in the company and directly act for its objectives: they hold formal positions necessary for the organization and are bound by contractual relationships. A common type of internal stakeholders can be identified in the investors who are usually affected by the business outcome.

External stakeholders are not constituent part of the organization but can be linked to contractual relationship, being affected by the business actions. They generally include costumers, communities, partners and suppliers, as well as government and creditors.

In our case the analysis starts from the identification through brainstorming activity between experts, which is linked to the creative production of ideas, that means doing a free and random list of all the people, the organizations, and subjects that fall into the projects. After that, the analysis will move to the components of the knowledge triangle followed by the analysis of the Logistics context.

2.1. Key matrix for stakeholder analysis

We have decided to adapt the “power-interest” grid of Ackermann (Eden & Ackermann, 1998) because we consider it a suitable structure and a relevant one to the needs of the project. Thanks to this framework, you can map the interests of the stakeholder, prioritising them in order of importance, with a common approach which consists in mapping the interest and power or influence of each stakeholder group on a quadrant.

The power-interest grid, as shown below, helps to visualise the positions of individual stakeholders and the relations among them. The two dimensions of the grid – power and interest – show that not all of the players who have an interest in the project and its development also have the power to influence decisions about it.

The two-dimensional grid generates four categories of stakeholders:

Key Players: have both an interest and significant power

Relevant: have an interest but little power

Other: have power but little direct interest

Crowd: have little interest or power

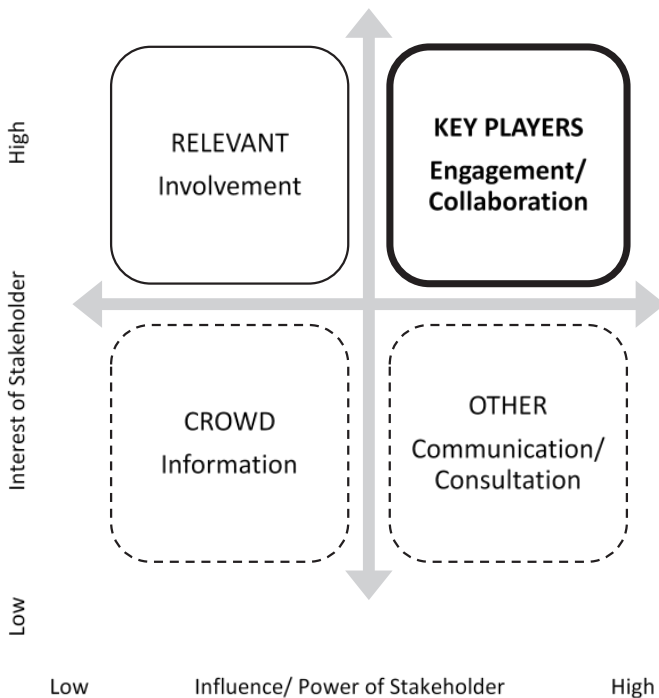


FIG. 1 - POWER/INTEREST MATRIX

SOURCE: AUTHORS' ADAPTATION FROM ACKERMANN ET AL. (1998)

Following the frame above, different types of stakeholders have been placed into three different classes. It has been decided not to consider for the analysis the fourth category “Crowd”, since their lacking interest and influence on the planning dynamics.

A) Project's Users/ Beneficiaries:

- **HEIs**
- **Companies**
- **Research Institutions**
- **Professional Associations in Logistics**
- **Universities**
- **Corporate Universities**
- **R&D Departments**

These categories can play a key role into the project with a high influence on its development and growth. They will implement several strategies for increasing it and they will collaborate towards the decision they have to take. They mainly focus on the relationship management, trying to maintain a continuous level of engagement between the organization and its audience, achieving relevant advantages for their purposes.

- **Workers in Logistics**
- **Students/ Graduates in Logistics**

These users are considered "relevant" for the project itself. They reveal a high interest with a less influence on it due to the lack of useful instrument and relative knowledge that means suitable tools to create forms of development within the project.

B) Influencers on the project development:

- **Scientific associations: both at European** (e.g. European Academy of Management) **and national level** (e.g. in Italy: AIDEA, ASSIOA..)
- **Logistics organizations**
- **Trade unions**
- **Economic ministries** (Labour, production, economic development etc.)

They are players with high influence, able to effect on the growth of the project but with a lower interested to collaborate towards its development.

C) Other:

- **Local community** – involved at a local level
- **National and European communities** – involved at international level

They are still considered as stakeholders because they will be involved in the project's outcome, but will not be analysed in details.

3. Stakeholder Planning and Communication

3.1. Analysis of High-impact methods and instruments

Starting from the results of the analysis proposed in the previous section (O2A2), in this one we focus on the selection of those methods and instruments that can create the major impact on the development of the Knowledge Triangle, related to the most relevant stakeholders analysed: Key Players and Relevant.

In the analysis of those methods and instruments selected for the evaluation of the Knowledge Triangle, the impact measurement method used is the three-level scale: *High*, *Medium*, *Low*. The *High* level is assigned to methods and instruments that are supposed to have the highest impact in the development of the Knowledge Triangle and to its continuous improvement. The *Medium* level is related to those which can potentially create a relevant impact but are dependent to the specific status of the organization at the moment of the assessment; the *Low* level, instead, is assigned to those methods and instruments which are preparatory to the other ones. With this *ratio*, the most influential methods and instruments selected (*High*) are the following:

- Development of specific courses (Bachelor, Master, Professional) focused on Logistics, based on the needs and potentialities of the entity;
- Selection of educational contents, programmes, methods and lecturers based on Good practices with external partners;
- Preparation for courses' Accreditation process;
- Development of conjoint activities with business and research entities;
- Organization of events to disseminate results on Logistics, from both internal and external project;

- Development of coordination, offer of internships on Logistics;
- Development of temporary and/or permanent partnerships on Logistics;
- Development of PhDs, bourses, fellowships, professorial chairs on Logistics topics;
- Development of production of intellectual outputs: papers, patents, software etc. on Logistics.

For this group of methods and instruments, in the following paragraphs we present the list of actions, strategies, channels and objects of communication to be developed for the Key and Relevant Stakeholders.

3.2. Action and Strategy

Each method and instrument presented in the previous document, in this section has been related to an initial action, which is considered to be essential for a correct implementation of the Knowledge Triangle: the assessment of the current status of the organization. This assessment represents a moment of self-acknowledgment of the strengths and weaknesses in terms of collaboration and continuous-improvement systems and it will enable the organization to develop the most appropriate actions and strategies to enhance them. For this preparatory action, the strategy for the stakeholders' engagement is the dissemination of the FRAMELOG Assessment Tool, which has been developed within this project and presented in the O2A1, both via direct and via indirect communication, as presented in the Attachment II.

The other Actions and Strategies are related to the single method and instrument and have been summarized in the Attachment II and III of this document.

3.3. Channel of Communication

Analysing the channels of communication, we need to differentiate between the channels selected for Key Players and Relevant Stakeholders. To communicate with the Key Players in order to engage them, a series of channels of communication has been selected. Starting from

the most effective ones, there is the need of face-to-face meetings and events with the most influential persons of the organizations composing the Knowledge Triangle, to emphasise the relevance of this pattern of continuous communication for the improvement of every organization. Also focus groups can be a valid way to engage with the Key players, so that they will be more effective in the proposal of new theories and solutions.

Other useful channels of communication can be identified with on-line material, that remains always available to be consulted and downloaded for further thinking from the consultants. For example, the project official website can be considered as the first point of dissemination of project's contents and suggestions, in all its parts: in the section "Results", all the drafted documents and the proposed Assessment tool can be accessed. In the section "Event", all the data proposed and projected during official events related to the project can be easily viewed: podcasts, videoconferencing can be analysed as high-impact audio/visual channels of communication, enabling all those who could not be able to participate to the event to be aligned on the last achievement in terms of communication.

Dissemination events are the most important channel of communication in the first stage of Stakeholder Engagement: the presence of representative of Key Players at those events has the important role to make them focus and network on the project's innovative results and start thinking about a possible improvement of their activities. The projected and printed material should have the same format all over the European countries in which those events will take place, to maintain a substantial and formal uniformity.

The printed material, during the dissemination events, can be considered as the first guideline to follow the contents of the event, to stimulate participants' interest and to leave all the references to find the complete material. As printed material, a brief questionnaire on the quality of the event should be inserted to guide the responsible persons to adjust the event format to be more effective.

A channel of communication already used is the direct emailing to relevant reference persons in Logistics institutions, moving from HEIs,

to Research institutions and Companies. For the dissemination of the Assessment tool, in fact, all the project's Partners proposed a medium of 50 direct contacts of their own Partners and collaborators to first assess the quality of the tool and provide with the first relevant results. For the same list of contacts, a plan of scheduled newsletter about the project has been considered as a valid channel to spread further project's achievements. All the updates about new documents and research activities are not only inserted in the FRAMELOG website but simultaneously uploaded on the social media's platforms developed for the project: the Facebook Official Project's page and the Twitter ones. Such channel of communication has been used to shorten distances between Key Players and to ease the updating of information and events' organization.

For the Relevant Stakeholders, the most significant channels of communication to be used move from the same online material and social networks presented in the previous part of the section, to face-to-face presentations in the workplaces/ educational institutions. The relevance of online communities and groups (e.g. LinkedIn, Google Groups) has been highlighted in the last years to spread informative documents and improve networking chances among all the members. The importance of Relevant Stakeholders' communication is to be related to the main focus of the project, which is to create a continuously-improving Knowledge Triangle on Logistics: without the incorporation of the major beneficiaries in the communication activities, the potentiality of such achievement will be lower.

After the description of the selected channels, in the next sections we will present the different objects of communication and the related timing selected for the different communication strategies.

3.4. Object of Communication

For the Key Players, as introduced in the previous section, the first object of communication has been the FRAMELOG Assessment tool, to evaluate the initial situation of collaboration inside the organization. This Tool will always remain available and approachable from the FRAMELOG website for all the potential beneficiaries. The final aim of

FRAMELOG is to maintain the Tool consultable in the following year to let the organization to self-assess themselves in different times, to appreciate the effective improvements made thanks to the FRAMELOG Knowledge Triangle.

Concerning the other objects of Communication, the most relevant ones are the already defined papers, in order to spread the information collected at this stage of the project, susceptible to be increased with the following documents. The objects we are referring to are related to actions and strategies developed also for Key Players and for Relevant Stakeholders:

- Compendium of Good practices;
- Definition of Knowledge Triangle;
- LogiComp (competence tracking tool);
- EQF and ELA certification processes (European level);
- Guidelines for national accreditation system;
- Guidelines for the development of conjoint activities;
- Guidelines for the development of dissemination activities;
- Guidelines for Coordination and Guidelines for Offer of Internships;
- Guidelines for development and management of Partnerships.

Except from the Compendium of Good practices, the Definition of Knowledge Triangle and the LogiComp (competence tracking tool), all the other objects of communication will be presented in the following document, "Guidelines for implementing the framework for efficient 'knowledge framework'.

The direct relation between methods, actions, strategies and object of communication is presented in the Attachment I and II, differentiated between Key Players and Relevant Stakeholders.

3.5. Timing and use of resources

To better define the effort in the presented Engagement Plan, we propose a reasonable timing and use of resources that match the other elements of the Plan.

As Timing, we have assumed to align the Engagement Plan activities to the length of the project, hoping that in this period the participants

would propose a spontaneous series of actions and events. In fact, for all the actions we predict the frequency of two dissemination events per year of project until its conclusion and the constant presence of informative material on online platforms.

As use of resources, we used the *High-Medium-Low* scale again, to give an indication of the resources needed to carry out the engagement activities: in particular, for the disseminating events the use of resources will be higher (*High*) than the pure publication of informative material on online platforms, which have been associated with the label *Medium*. That is, for the first group, actions are composed of different steps, from the event management, the rent of a suitable location, the preparation of printed material and all the marketing activities to be developed.

Following the PDCA cycle, in the Table inserted in the Attachment II, we present the communication plan to engage the Key Players in relation to the selected highest-impact methods and instruments. In particular, we present a summary of actions, strategies, channels and objects of communication, frequencies and uses of resources. In Attachment III, a presentation of the communication plan to involve the Relevant Stakeholders is reported.

4. Expected Results

With the Stakeholder Engagement Plan, our aim is to communicate the potentialities related to the correct implementation of the Knowledge Triangle, which has been analysed as a fruitful pattern to enhance collaboration between Higher Educational Institution, Research organizations and Companies. The systematic and explicit knowledge package about collaboration in the field of Logistics that has been created in this project needs to be disseminated to reach the widest panorama all over the European countries, in particular to be communicated to the most influential reference persons in Logistics.

The strategies, actions and channels of communication selected are structured as to reach this scope in a fast, efficient and effective way. The main objective that we expect to achieve is to make every responsible person inside the educational, research and business or-

ganizations aware of the Knowledge Triangle on Logistics' advantages and potentialities, in order to consider a potential evolution of the standard flow of activities with the increase of external collaborations. In parallel, we hope that the diffusion of the selected "Compendium of Good practices" and the "Guidelines for implementing the Framework" will help in guiding this evolution in the most effective way, to ensure the reduction of potential implementation problems and the lowest switching costs. The developed FRAMELOG Assessment Tool is an essential preparatory instrument to orient further actions, helping the organizations face their lacks and potential areas for improvement in terms of collaboration.

The highest scope of FRAMELOG is activating a Knowledge Triangle that will successively self-sustain and grow in an independent way, in a virtuous cycle, through the dissemination of practices, methods, instruments and guidelines. For the moment, the results are encouraging: in fact, the first dissemination activities realized by the project's Partners for the FRAMELOG Assessment tool have highlighted the willingness of organizations to question themselves and hopefully to consider the suggestions and instruments developed within this project.

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Attachment I

Systemic summary of communication plan for the Engagement of the Key Players

Stakeholder	Phase – Sub Topic	High-Impact Methods and instruments	Action	Communication Strategy	Object of Communication	Timing/ Frequency	Use of resources
All Key Players		All	Current situation assessment	Creation and dissemination of a tool to self-assess the actual status of collaboration with external organization in terms of Logistics	FRAMELOG Assessment tool	Twice per year until the end of the project - Always available for the online material	High
HEIs and Professional Associations		Development of specific courses at several levels (Bachelor, Master, professional) focused on Logistics, based on the needs and potentialities of the entity	Engagement of the stakeholder for the creation of a consultative Strategic Committee comprised of key players on Logistics to fund and develop courses	Highlight the potentiality of the development of specific courses on Logistics connected to the local/ regional territory	Compendium of Good practices – Guidelines		High
All key players	1 – PLAN 1.3 - Collaboration in Designing Courses	Selection of educational contents, programmes, methods and lecturers based on Good practices with external partners	Involvement of all key players for the development of coordinated meetings for the selection	Dissemination of project's results and specific tools to guide the selection of educational contents, programmes, methods and lecturers on Logistics topics	Compendium of Good practices, LogiComp (competence tracking tool) to guide the selection of contents		High
HEIs		Preparation for courses' Accreditation process	Communication of potentiality of Accreditation in terms of enhancement of Knowledge Triangle	Spread of informative material about the accreditation process on Logistics and communication of the advantages	EQF and ELA certification processes (European level), Guidelines for national accreditation system		Medium
All key players	2 - DO 2.1 - Conjoint Activities	Develop of conjoint activities with business and research entities	Communication and Engagement for the opportunity of the development of conjoint actions to enhance communication in the Knowledge Triangle	Spread of project's results; Dissemination of Guidelines to help the creation, development, management of conjoint actions	Compendium of Good Practices; Guidelines for the development of conjoint activities		Medium
All key players	2 – DO 2.2 - Dissemination Activities	Organization of events to disseminate results on Logistics, from both internal and external project	Communication and Engagement for the opportunity of the dissemination of internal and external results for the implementation of the Knowledge Triangle	Spread of project's results; Dissemination of Guidelines to help the creation, development, management of dissemination activities	Compendium of Good Practices; Guidelines for the development of dissemination activities		High
All key players	2 - DO 2.3 - Internship	Coordination and/or offer of internships on Logistics	Communication to stakeholders for the opportunity of implementing internships	Dissemination of Compendium of Good Practices and Guidelines for internships implementation	Compendium of Good Practices; Guidelines for Coordination and Guidelines for Offer of Internships		High
All key players	2 - DO 2.6 – Partnership	Development of temporary and/or permanent partnerships on Logistics	Communication and Engagement for the development of partnerships focused on Logistics activities	Dissemination of project's results in terms of current Good Practices and of specific Guidelines to orient partnerships	Compendium of Good Practices; Guidelines for development and management of Partnerships		High
All key players	2 - DO 2.7 – Funding	Development of PhDs, bourses, fellowships, professorial chairs on Logistics topics	Communication and Engagement of stakeholders for the provision of specific funds on Logistics activities	Dissemination of project's results in terms of current Good Practices	Compendium of Good Practices		High
All key players	3 – CHECK 3.3 - Production	Development of production of intellectual outputs: papers, patents, software etc. on Logistics	Communication and Engagement for activities and funds for the intellectual production in collaboration with external Partners	Highlight the opportunity of networking and development of coordinated actions as basis for the creation of shared intellectual production	Compendium of Good Practices		Medium

TABLE 1 - SYSTEMIC SUMMARY OF COMMUNICATION PLAN FOR THE ENGAGEMENT OF THE KEY PLAYERS

Attachment II
Systemic summary of communication plan for the Engagement of Relevant Stakeholders

Stakeholder	Action	Strategies	Channel of Communication	Object of Communication	Timing/ Frequency	Use of resources
Workers in Logistics	Communication and consultation Communication and consultation	Dissemination of list of organizations that offer accredited professional courses and specific certifications on Logistics	- Face to face: events, presentations during work fairs - Online: blogs, forums, communities, online groups, groups social media	Compendium of Good Practices, ELA competence/ abilities qualification system	Always available online – Several times per year in Partners' countries until the end of the project	Medium
Students/ Graduates in Logistics						
Logistics sector	Communication and involvement	Dissemination of project's results and involvement in further communication	- Face to face: events, presentations during sector fairs - Mailing - Online: blogs, forums, communities, online groups, groups social media	Compendium of Good Practices, Definition of Knowledge Triangle, Guidelines	Always available online – Several times per year in Partners' countries until the end of the project, during dissemination events	High

TABLE 2 - SYSTEMIC SUMMARY OF COMMUNICATION PLAN FOR THE ENGAGEMENT OF RELEVANT STAKEHOLDERS

GUIDELINES FOR IMPLEMENTING AN EFFICIENT FRAMEWORK FOR KNOWLEDGE TRIANGLE

Dott. Scipioni Sara, University of Pisa

Dott. Gaiotto Beatrice, University of Pisa

Prof. Niccolini Federico, University of Pisa

Prof. Giannini Marco, University of Pisa



For this chapter, we acknowledge the contributions provided by Kamelia Stefanova, UNWE, Dorina Kabakchieva, UNWE Nicole Geerkens, ELA, Cristina Nicolau, UTBv, Paolo Bisogni, AIOLOG.

Abstract

The Supply Chain Management, and more generally, logistics, are influenced by a continuously increasing number of technological and market changes, such as globalization, big data opportunities, cybersecurity threats and industry 4.0 issues.

This environmental instability requires a process of continuous updating in professional knowledge and skills. From this perspective the cornerstones of the well-known Knowledge Triangle, higher education, research and business organizations, need to reciprocally and proactively cooperate to generate up-to-date expertise and qualified professional staff in this precarious logistic environment.

These proposed Guidelines will contribute to enhanced collaboration between higher education, research and business actors in the logistic area, by incorporating EU recommendations in the fields of higher education, lifelong learning and work-based learning methodologies. This will help in harmonizing qualification schemes and certification of skills to make them more effective during the recruiting, training and other human resource management processes.

Moving from a stakeholder-oriented approach (Scipioni et al., 2018) and a multiple case study analysis of thirteen good practices (O1 report), a comprehensive, holistic and user-friendly framework has been implemented to improve the effectiveness of knowledge exchanges, circulation and creation in the logistic Knowledge Triangle.

Consulting the document, readers will find specific guidelines for boosting cooperation among the different stakeholders to enhance the quality, market-orientation and the competitiveness of the educational offer.

The Guidelines offer a set of processes to be followed, in order to implement an efficient framework for the Knowledge Triangle. Guidelines provide clarity regarding “how to”: identify organizational structures, develop courses and disciplines, accredit courses, involve industry experts in educational programmes, develop joint activities, create intellectual outputs, disseminate key events and other core activities necessary to effect an effective knowledge circulation in the logistic area.

The guidelines do not only provide a theoretical framework: in order to concretely help the logistics actors involved, every proposed action or process will be accompanied by a pragmatic case study chosen around Europe as exemplary in the specific aspect taken to consideration.

1. Introduction

In order to better implement the knowledge triangle, some pragmatic process proposals have been suggested, with the aim of obtaining more efficient collaboration among universities, research institutions and companies: this should help the development of expertise to be included in the logistic environment.

In this regard, implementing the specific guidelines, attention has been mainly, but not exclusively, focused on suitable interactions and tools which can move companies and training closer.

Also in the literature, particular emphasis has been placed on this matter: on one hand, scholars (Markkula, 2013) have recognized the great potentialities of companies and universities collaboration, and, on the other hand, several academics have debated as to why business schools do not refer sufficiently to practical reality (Bennis & O'Toole, 2005), and why schools are not more connected to the business world if they want to produce future workers well established in the business environment.

Recent studies (McKinnon et al., 2017) in the logistic area has valued the importance and availability of logistic skills at employment level. The presence of "a serious skills shortage" in all groups of logistic standards (staff, supervisors, managers) and across all competence categories (knowledge, personal, technical, communication, administrative) at international level is considered extremely important.

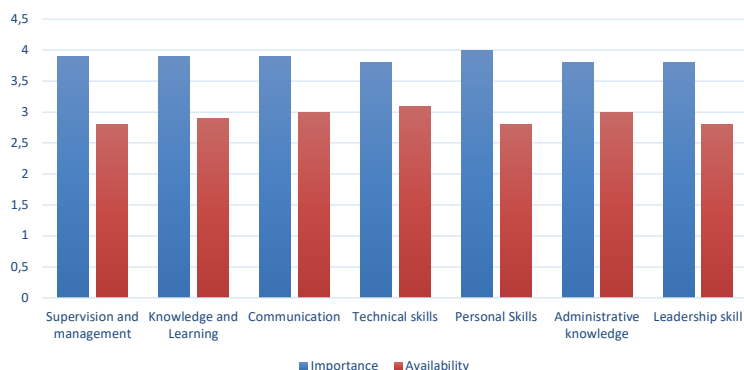


FIG. 1 - SKILLS SHORTAGE IN DIFFERENT GROUPS OF LOGISTICS QUALIFICATIONS ACROSS THE COMPETENCE CATEGORIES (SCALE: 1= VERY LOW. 5 = VERY HIGH)

SOURCE: MCKINNON, A., FLÖTHMANN, C., HOBERG, K., & BUSCH, C., LOGISTICS COMPETENCIES, SKILLS, AND TRAINING: A GLOBAL OVERVIEW, 2017, P. 17

The above-mentioned findings show in orange the actual skill availability while in blue the importance of the logistic competences. The study has analyzed four levels, “Operational blue-collar staff”, “Administrative staff”, “Supervisors” and “Logistics managers”, and for all of them it highlights that all competence categories are considered to be of high importance (average around 4/5) to be developed with regard to the current situation. Personnel on all levels need to perform these tasks effectively, be communicative, possess technical and interpersonal skills and be able to learn and acquire further knowledge on a regular basis. Supervisors and managers complement the basic skill sets with leadership skills. The high importance attached to all the competence categories confirms the idea that logisticians must possess very diverse skill sets to master all the challenges they routinely face.

Even if Europe is the leading continent regarding the performance of logistic activities (with seven nations in the first eight positions of the 2016 Logistic Performance Index ranking), the overall situation is geographically heterogeneous, with a high concentration of best-practices in the northern part of the continent (McKinnon, 2017).

From this perspective, in the European context, partnerships between universities, research institutions and companies could contribute to finding resources in order to improve the knowledge triangle: these collaborative relationships, in addition to helping to gain some resources for the universities, allow the improvement of research quality and have a substantial impact on the innovation of the industrial sector. The knowledge transfer produced through these partnerships turns out to be crucial, especially for small and medium-sized enterprises, which usually do not have the enough resources to invest directly in the necessary research and development activities.

The following guidelines can provide some answers to solve the problems of training and recruitment in the logistic field, by strengthening the importance of academic education aimed at employment in logistics and its international appeal through closer and more effective cooperation between universities, research and business.

For instance, we will see how the consulting modules, the inclusion of guest lectures within the educational courses in logistics and experiential learning can be beneficial for the creation and dissemination of knowledge.

2. Logistic Knowledge triangle key concepts and aim of guidelines

The series of actions to be implemented to reach a higher level of knowledge circulation and hybridity and, therefore, a higher level of collaboration between the Knowledge Triangle actors, partially depend on the organizational status and the actions already performed. To potentially cover all the possible situations of the organizations which would approach the Knowledge Triangle framework for Logistics, our analyses move from some general actions, such as the creation of a new educational courses focused on logistic topics (including the identification of the most suitable administrative structure to manage the collaboration activities) to those activities that help the organizations which already represent some forms of partnership to improve their performance, for example, the most suitable combination of educational methods.

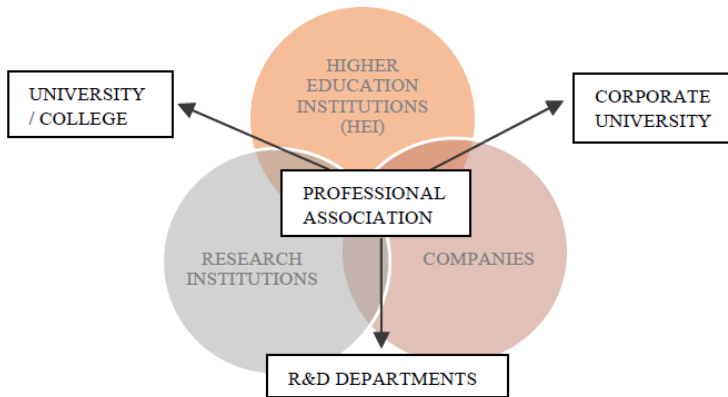


FIG. 2 - KNOWLEDGE TRIANGLE APPLIED TO LOGISTICS

SOURCE: SCIPIONI S., GIANNINI M., "DEFINE 'KNOWLEDGE TRIANGLE' CRITERIA AND INDICATORS AND RELATED ASSESSMENT TOOL", 2018

The aim of the following guidelines is to provide a more detailed analysis of those actions which are considered to be highly effective in the implementation of the Knowledge Triangle. Presenting the key actions to perform and reach the highest level of collaboration will enable the key players of the Knowledge Triangle to create a virtuous cycle of knowledge circulation from several viewpoints and let their organization evolve, remaining aligned with the continuous changes in the logistics area. With the guidelines, each institution might consider the review of their performance on the basis of the research activity results and of successful good-practice examples and/or be inspired by them and develop new ideas, more in line with the features of the institution itself. The most important aim of the guidelines is not to drive each organization to work with the same instruments and methods, but to create the basis for a collaborative ground where up-to-date solutions and projects focused on the Logistics area can be developed. The dissemination of good practices would also potentially enable networking activities between the responsible persons involved, to spread and develop innovative results. The final results we aim to obtain are: self-sus-

taining process of knowledge creation and circulation in the logistics area, with the training of students and workers with market-oriented methods, the development of innovative proposals for logistic activities, the establishment of projects and trials focused on their progress, their implementation in real business realities and the dissemination of the experience, both positive and negative sides. All these actions would be performed in a collaborative way by all the actors making up the Knowledge Triangle, so that it will be the only way to lay the foundations for a constantly improving knowledge creation process, not limited to the single reality of the specific organization. In the following paragraph, the methodological approach used for the development of the guidelines is presented.

3. Methodology

The “Guidelines for implementing an efficient framework for Knowledge Triangle are the conclusive document of an articulated process of scientific analysis of the Knowledge Triangle framework applied to the logistics field at European level.

Starting from a detailed analysis of the concept of the Knowledge Triangle and its composition, we defined some criteria and indicators and we focused on the fundamental phase of its implementation process, which is the assessment of the current situations in terms of collaboration in the Logistics area in the three fields involved: Education, Research and Business. To achieve this, we developed a web-based survey (O2A1), available in all the online platforms related to the FRAMELOG Project. The FRAMELOG Assessment Tool is based on the analysis of the activity cycles of the seven key actors making up the Triangle and on the identification of those potential contact points between the different players. This investigation was conducted on the basis of the Plan-Do-Check-Act cycle pattern. Linking the experience raised with the Compendium of Good Practices completed in Output 1, we set a series of questions oriented to evaluate if the current situation of the assessed organization could be aligned to the currently available Good Practices, covering all the activities performed.

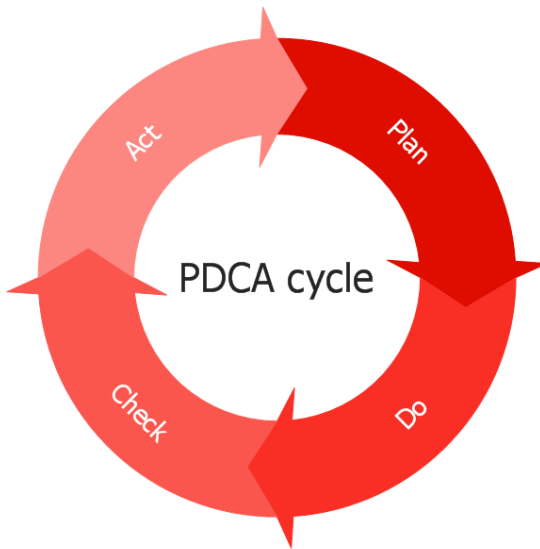


FIG. 3 - PDCA CYCLE

SOURCE: ELABORATION FROM THE AUTHORS

After the implementation of the assessment tool, we moved to the identification of methods, instruments and related actions that could be used to achieve a higher level of collaboration between the Knowledge Triangle stakeholders (O2A2), to cover possible weaknesses arising during the first assessment. For the development of such indications we maintain the PDCA cycle approach, to ensure the parallelism of the two phases.

Then, moving from a stakeholder-oriented approach (Freeman, 2004), a Stakeholder Engagement Plan (O2A3) was developed (Husted & Allen, 2010) aimed at identifying communication strategies to engage and maintain relations with the potential key stakeholders of the Knowledge Triangle applied in Logistics. Here, the identification and engagement of core players and relevant stakeholders was considered essential for the effective development of such collaborative framework and, indeed, the Plan focused on actions between those actors. For the

communication objectives, we made a selection of those documents and instruments that could have a higher impact on the implementation of the Knowledge Triangle.

As a final part of the analysis, in this document we present the guidelines for the implementation of an efficient Knowledge Triangle, to identify in detail possible procedures to be applied in the different stakeholders' situation, to enhance their level of collaboration and increase the circulation and creation of knowledge within the so-called "Triangle". For the development of the Guidelines we selected those actions which would have the strongest impact, to ensure the user-friendly format and the effectiveness of the analysis.

The guidelines derive from a further in-depth research activity, which originated from mixed methodology, based on four kinds of approach sources.

Firstly, the analysis of good practices, where we have considered state-of-art examples in the area. This analysis derives from both the Project's Compendium and other on-field analyses performed.

Secondly, the initial results (around 100 surveys) of the FRAMELOG Assessment Tool. The assessment tool's results were used as a final validation of the outcome of the other two previous sources; in fact, they confirmed the weakness areas already hypothesized in the institutions comprising the Knowledge Triangle.

Subsequently, a rich literature review was developed. Given the complexity of the phenomena to be investigated, the literature review covered a wide range of topics, such as the more general literature on the need to up-date the HEI's system (Bennis & O'toole, 2005); the role of knowledge in logistics (Hult, 2006); the new most influential trends concerning logistics (Barreto et al., 2017; Lamba, 2017; Macaulay et al., 2015; Pfohl, 2017; Wang, 2016); the competency models in the logistic area (APICS, 2014; Gammelgaard & Larson, 2001; Harvey, 2001; McKinnon, et al., 2017) and, most of all, the enforcement of the Knowledge Triangle and the collaboration between the Knowledge Triangle actors (Bak, 2011; Green & Farazmand, 2012; Jacobson et al., 2005; Markkula, 2013; OECD, 2016; Sciglimpaglia & Toole, 2010; Thune, 2010), particularly in the logistic area (Bak, & Boulocher-Passet, 2013; Erturgut, &

Soysekerici, 2011; Holcomb, 2015; Myers et al, 2004; Stuba, 2017; Van Hoek et al., 2011; Vollmann et al., 2010; Walk, 2010; Webb et al., 2014).

Finally, the outputs of the previous analysis gave us a wide and fruitful basis for an inspiring series of brainstorming activities, which we performed with experts from the three fields analysed (education, research and business) with reference to various aspects to be considered for the implementation of an efficient Knowledge Triangle.

After the brainstorming activities, the validation of the findings and the selection of the thirteen high-impact Guidelines worthy of being developed came from other consultation activities between different experts and the Project's Partners. To effectively convey the potentialities of a correct application of the indications inserted in the Guidelines, every "line" has been explicitly connected to a Good Practice box, in which the key points for the implementation of the collaborative framework are explained.

4. Structure of the guidelines

Following the same pattern used to organize the analysis of the different topics relevant to the deployment of the Knowledge Triangle, the guidelines have also been arranged according to the PDCA model in the same areas: Guidelines for Planning, for Performance, for Check and Act. We selected ten guidelines that cover all the four phases of the cycle, which we present in the following list:

A. Guidelines for Planning

1. Starting the process: initiate the SWOT analysis and identify the basic organizational structures
2. Selecting educational disciplines, contents and methods
3. Embedding industry experts as teachers and/or lecturers into educational courses
4. Accrediting courses: the key process

B. Guidelines for Performance

5. Developing conjoint activities with business and research entities
6. Improving offer of internships and stage

7. Promoting theses, PhDs, research grants, fellowships and professional chairs

8. Disseminating results

C. Guidelines for Check and Act

9. Measuring effectiveness of conjoint activities

10. Engagement of new potential stakeholders

The different distribution of the guidelines in the sections is determined by the importance assigned to the PDCA phase and the related activities. The greatest importance has been given equally to the “Planning” and “Performance” phases, which present four “lines” each.

In order to develop effective collaboration between the Knowledge Triangle actors, the “Planning” phase is fundamental in creating the structural conditions to “activate” the knowledge triangle and the ground for fruitful discussions regarding the further activities to be implemented. In particular, we focused our attention on indications regarding the engagement of key actors for the opening of roundtables and on approaches to the design of courses.

Moreover, the implementation of the agreed conjoint activities can be considered as a strategic element for the effective functioning of the Knowledge Triangle. In the “Performance” phase, in fact, we covered the most relevant conjoint activities that could be performed in collaboration among the three actors of the Triangle, such as scientific and research projects, internships and work placements, various kinds of grants and dissemination.

Regarding the “Check” a core “line” to be followed was presented. In fact, these indications could be applied to all the actions presented in the other Guidelines, so they can place the attention on the need for ongoing and final assessments of the quality and efficacy of the activity performed. Finally, the “Act” guideline is proposed to highlight the opportunity for a constant review of current collaborations and activities oriented to the involvement of new actors that could give new impetus to the creation and circulation knowledge in the logistic field.

The guidelines have to be considered as indications that could improve the quality of knowledge creation processes within the Triangle, through mechanisms capable of activating the spiral of knowledge creation among the key actors.

Applying these guidelines, the PDCA circle can be “opened” in a necessary evolutionary perspective becoming a knowledge creation spiral that stimulates a process of continuous labour market-oriented generation of skills and competences in the Logistic field as shown in the following figure.

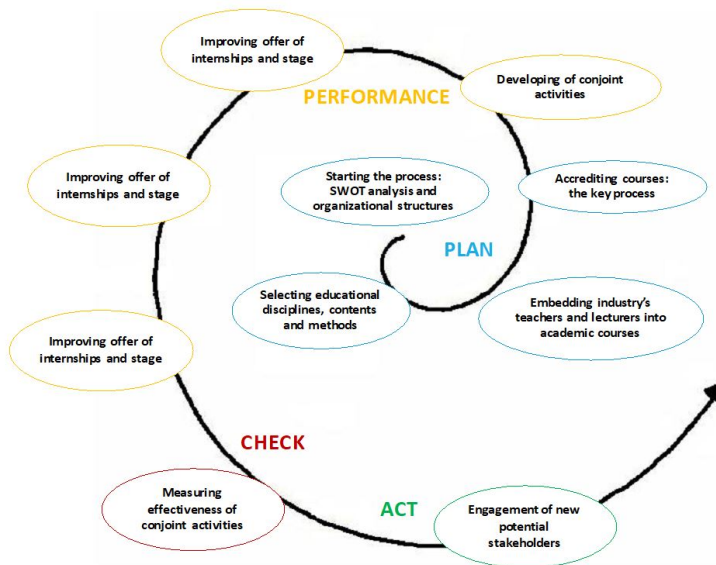


FIG. 4 - PDCA APPROACH SEEN AS AN EVOLUTIONARY KNOWLEDGE CREATION SPIRAL THROUGH THE GUIDELINES APPLICATION

SOURCE: ELABORATION OF THE AUTHORS

5. Guidelines for PLANNING

5.1. Starting the process: initiate the SWOT analysis, involve key partners and create the basic organizational structures

The process that underlies the creation of a High Education course includes a series of strategic and structural activities that will lay the foundations of the knowledge circulation and creation within the so-called triangle.

After having pointed out the educational vision, some key steps are necessary: first of all, it is necessary to spread and share the vision between the potential key actors, through the involvement of the key stakeholders which can benefit from the collaboration.

Subsequently, it is equally important to select the actors to engage in the initiative, which can be private companies, NGOs, trade associations, research institutions and educational organizations, – at local, regional and national levels– involving financial resources, scientific and experiential know-how. Following this cross-sectorial approach it will be possible to create a structural link among the actors in order to improve the quality of the knowledge circulation in the educational system (Markkula, 2013; OECD, 2016)

Together with some core investors, it is interesting to involve a selection of key partners, as local companies, who can provide grants, financial contribution and curricular opportunities to the students.

The process also requires the establishment of a Governance body, made in the juridical form coherent with legal context of the Educational course (e.g. Strategic or other kind of advisory Committee) the appointment of a responsible person who will be in charge of the management of the future educational course, the recognition and recruiting of the teaching staff, the establishment of the course title and the additional services and space necessary for the practical implementation of the structure.

It is also fundamental to identify a series of educational requirements and needs related to the territory in which the course will be implement

5.2. Selecting educational disciplines, contents and methods

GOOD PRACTICE #1

NAME OF INSTITUTION: The Polo Universitario Sistemi Logistici Livorno (University Pole of Logistic Systems) – University of Pisa

KEY POINT: involving key partners and creating basic organizational structures

The Polo Universitario Sistemi Logistici Livorno, a branch of the University of Pisa, has been established on the 2006 thanks to the agreement signed between the University of Pisa and local Institution, such as the local Municipality, Province, Chamber of Commerce, and the Foundation of the main Bank (Cassa di Risparmi di Livorno), with the aim to realize on the Tuscan area a University level training course that can train highly competent profiles in the field of transport and logistics.

Starting from the planning phase, the key business actors of the territory were involved (such as the Port Authority), moving from their need to disposal of logistic skills and competences. That's why has been training young people able to read the context and help the companies in the changes area. Since the beginning, it has been established a Scientific and Technical Committee, which involved the participation of representatives both of the funding bodies and of the university. This Committee has been maintained and has the functions to address and check the university's action in relation to the scientific objectives of the study course.

After, starting from the 2009 this Logistic Educational reality (Polo Universitario) has become an independent service center, with an independent Governance body (Course Council), who developed the tasks as a common University Faculty council and started to operate autonomously. Additional services have been increased such as the canteen, administrative offices, a library and study rooms.

These preliminary activities of involvement of key partners and creation of basic and governance structures allowed a continuous innovation in the educational offer, the development of a students' entrepreneurial approach, with an interdisciplinary perspective that make their profile flexible from a professional point of view.



PICTURE 1 - POLO UNIVERSITARIO SISTEMI LOGISTICI

A large-scale comparative analysis of the educational offer already available in the market is certainly necessary for an effective choice of the disciplines, contents and methods to be implemented. A detailed examination of the good practices' programmes offered about logistics by benchmark HEIs organizations is considered to be fundamental.

As a result of this benchmark analysis, it will be possible to identify the main characteristics and programmes offered and above all, to identify the shortcomings of the existing disciplines already offered: their weakness could become the strength of our new educational offer.

After having examined the educational environment and its market, it is crucial to focus on the educational contents to be proposed: in addition to general subjects, it is essential to orient the course vision towards educational contents to contingent needs of the environment business, which are considered nowadays as the fourth industrial revolution in manufacturing and industries with the purpose to realize smarter industries connecting people, new technologies and innovation, such as Industry 4.0 (Barreto et al., 2017; Pfohl, 2017), Internet of things (Macaulay et al., 2015), Big Data (Lamba, 2017; Wang, 2016) or Cyber Security.

Thanks to the environment of Industry 4.0, companies are using IT technologies to improve overall performance with particular attention

to the logistic area, since the demand of high-personalized products and services is constantly increasing. The term Logistic 4.0 is used to combine the logistic purpose together with innovation and applications added by the Cyber-Physical System and it is connected to smart services and smart products, which are those able to perform activities that are normally performed by people.

Later, the second step would refer to a selection of contents using topics considered essential by the industry, focusing on the last innovative results achieved by ad-hoc research institutions goal oriented methods, as a first collaborative approach between the parties involved in the knowledge triangle, where the business environment and research institutes are involved in educational contents.

It is considered equally important the use of innovative educational methods based on students' collaboration and orientation to stimulate their creativity and self-entrepreneurship, for example experiential learning (Green & Farazmand, 2012), mocks logistics trials and augmented reality (Webb et al., 2014). The first one is an educational method which allows students in focusing on practical classes and on the integration between practice and theory. Some examples can be the so-called "job games", which are useful to teach and simulate logistics processes and allow students to experience the working reality during workshops. Kind of experimental learning exercises performed in groups support students to interact with each other and developing communicational abilities. Competences developed within this model would have a longer effect compared to theoretical knowledge. It is expected that students learn how to evaluate ordinary and extra-ordinary problems and take decisions according to the information provided. It seems clear that working in a simulated environment is a way of closing the gap between theoretical concepts and concrete applications.

Once the methods and programs have been identified, it will be necessary to ensure the effective learning of the audience and the effective ability to improve the acquired skills, encouraging the fulfilment of objectives within deadlines, for example through goal-oriented methods.

A real matter of interest and importance is the initial proposal on the participation of experts and researchers from the logistics area to

debate about the proposed programme of courses on Logistics, together with the development of relationships with companies and research centres to continuously update contents, programmes and methods. Throughout these courses, provided by the educational organization (e.g. University Department), students would have the opportunity to network with experts from industry and investigate real-business scenarios, enabling them to link between theory and the practice, deepen their knowledge and gain some experience. It will help to achieve balance between theory and practice and it should also give them the opportunity to get a first-hand understanding of real industrial processes, providing the opportunity to network with high level executives.

GOOD PRACTICE #2

NAME OF INSTITUTION: The University of Huddersfield, UK

KEY POINT: New interdisciplinary and experimental approach to education

The University of Huddersfield ("the University") is a non-profit public higher education institution (public benefit entity) located in Huddersfield, West Yorkshire, England

The institution has a long-standing reputation as a student-centered university, providing practice-oriented education and focusing on employability. The Department strengthens its position, providing a hands-on approach to learning with opportunities available for students to experience real life logistics environment. This practice-orientated approach to education is manifested in numerous initiatives.

All the courses provided are taught through series of lectures, tutorials, seminars and workshops. In addition to those traditional techniques, the department uses some innovative teaching methods such as case studies and projects, simulations and interactive games. For instance, the University of Huddersfield was the first in the UK that implemented the Fresh Connection (supply chain simulation game), widely seen in the business world as a powerful training tool, into its courses. Alongside this, the courses are packed with professional development opportunities through work experience, placements, mentoring, guest lectures, site visits, field trips and professional qualifications. This has come about due to the fact that the Department has established a large number of industry contacts and links with professional bodies such as Chartered Man-

agement Institute (CMI), Chartered Institute of Logistics and Transport (CILT), Chartered Institute of Procurement and Supply (CIPS).



IMAGE 1_SOURCE: FREEPIK

5.3. Embedding industry experts as teachers and/or lecturers into educational courses

The involvement of national and international guest professors and researches as lecturers or contract professors seems to be a weakness of the European system. According to the survey less than 30% of HEIs systematically use business experts in their courses (Fig. 5) and less than 50% of the universities help companies with business modules.

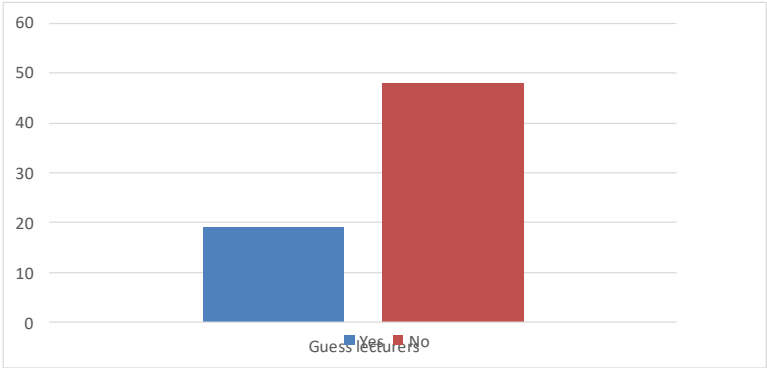


FIG. 5 - USE OF BUSINESS EXPERTS IN HEIS' COURSES
SOURCE: FRAMELOG ASSESMENT TOOL

The structural rapprochement of the HEIs and Companies' vertices of the knowledge triangles, through hybrid solution such as the embeddedness of business experts and the development of consultancy modules in educational courses, could considerably improve knowledge creation, providing industry knowledge in the supply chain management and logistics programs. HEI's institutions would face two key challenges when trying to incorporate guest lectures as part of an educational program (Van Hoek et al., 2011): the first is to identify the mechanisms by which guest lectures can be used more effectively to achieve the expected learning outcomes, and the second consists in the recruitment of skilled guest lectures once their role has been identified, focusing their expertise on the theoretical knowledge regarding supply chain management and logistics programmes provided by HEIs.

Great importance needs to be attributed also to recruitment of experts (at both national and international level) to hold seminars and/or courses and share their insights, practices, models about the future trends with students, working with them to improve their skills, knowledge and experience necessary for a successful career in logistics and supply chain management. This would establish mechanisms to create a continuous sharing of logistic competences, experiences and skills at different cultural levels among HEIs and companies' members.

The involvement of former students who have attended the course in the previous years and who can share their post-graduate experiences can be particularly effective: students will be able to interact with peers who have undertaken the same process and will be able to provide all the information and advice necessary to fit in the future work environment.

It would also be interesting to introduce hybrid teaching and learning methods, such as the consultancy approach taken from business (Bak, 2011; Bak& Boulocher-Passet, 2013). The consultancy modules can be a useful method to help students to develop the necessary competences and abilities and to provide companies with innovative and generative know-how. It can be defined as a transfer process of competences, knowledge and ability between educational institutions and companies, with the aim of supplying assistance, planning and developing job opportunities, as well as strategies and programs oriented towards compa-

nies. Its purpose is to involve students in dealing with real business situations, acting as real management consultants and interacting with the client-company. Students could interact with companies as an external agent who supplies ideas, suggestions and problem-solving strategies in real business contexts. The inclusion of consultancy modules in educational lectures should produce real benefits such as student's advanced learning, a higher level of commitment through relations implemented with companies, major communication and team building.

Lecturers have the task to identify both the company and the appropriate project, evaluating the connection between the study course and the student's level. The possible pattern of implementation can be developed as shown.

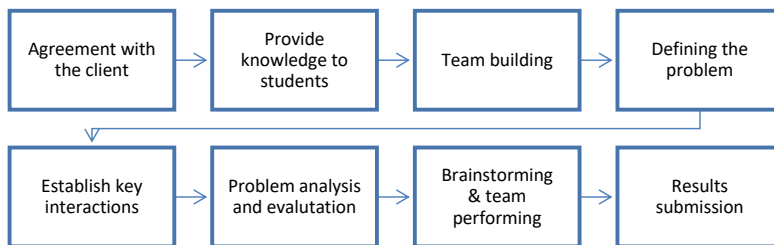


FIG. 6 - POSSIBLE PHASES OF A HYBRID (HEI-PRIVATE COMPANY) CONSULTANCY PROCESS

SOURCE: ELABORATION FROM THE AUTHORS, BASED ON BAK O. (2011)

GOOD PRACTICE #3

NAME OF INSTITUTION: Montanuniversitaet Leoben, AUSTRIA

KEY POINT: Embeddedness of business experts into educational lecturers
Montanuniversitaet Leoben, located in Austria, thanks to a number of close collaboration between the parties involved, has developed educational programs between university and business.

Researchers, teachers and logistics practitioners complement each other to create innovative education models: practitioners of the companies involved teaching in special courses at the university and imparting their expertise; universities and companies jointly develop and implement training pro-

grams on new innovative topics and technologies; the companies support the establishment of a logistics lab at the university by providing technology and software; students do internships in the companies, having the opportunity of being employed by the companies after graduation, building a further bridge.

Moreover, the logistics association is responsible for quality assurance of the courses, and as a next step, an accreditation of courses following the European Logistics Association (ELA) Standard for Logistics Competence is planned.

The specific educational initiatives can be summarized as following:

- Establishing an in-house training program for SSI SCHAEFER, developed and taught by the university (5 modules).
- Establishing a course on 'Special logistics applications', provided for the university by experts from both the companies, as associate lecturers from industry
- Establishing a regional logistics conference in cooperation between BVL, KNAPP, SSI SCHAEFER and Montanuniversitaet Leoben



PICTURE 2 - MONTANUNIVERSITAET LEOBEN

5.4. Accrediting courses: the key process for educational course alignment

In both general and logistic terms, the level of efficiency of the courses proposed to students and

works was found to be inadequate. In the Logistics area, this is highly critical because the courses could easily focus on one specific aspect of the Logistics field (e.g. on engineering topics, rather than the Supply Chain Management ones) leaving other, which could also be useful to complete the correct training for logistics job positions in various companies.

For this reason, it is recommended that there should be the accreditation of the educational courses on Logistics, both those already developed and the courses to be created, in order to insert them in a public recognized list of high-quality programmes, assuring the level of quality of the degree programs in terms of effectiveness and efficiency.

To access the procedure for accrediting the courses, first it is important to select the correct institution that can assess the educational organization, according to its strategic orientation. For example, for Universities and Research institutions in most the European countries a National Agency for the evaluation, which could present slightly different procedures for accrediting courses, is available. Usually, in the Agencies websites, a detailed list of the requirements and documents to be prepared for the accreditation, easily downloadable (e.g. ANVUR, the Italian National Agency for Evaluation, <http://www.anvur.it>). In the procedure, the utmost attention is given to the course contents, since they have to be consistent with the accreditation requirements, but also with the formal structures of the organization that can guarantee the level of quality of the overall educational offer.

For the Logistics field, a very interesting example of accreditation of courses is offered by the European Logistics Association (ELA), which is presented in the box below as Good Practice.



IMAGE 2_SOURCE: FREEPIK

GOOD PRACTICE #4

NAME OF INSTITUTION: ELA

KEY POINT: Course accreditation process in Logistics

ELA, European Logistics Association, is an European federation of 30 national organizations, covering almost every country in Central and Western Europe. The scope of the Association, is not for profit organization, is “to provide an international forum for networking, the promotion and development of the logistics and supply chain profession” (source: ELA Official website, www.elalog.org/). Actually, it reaches about 50.000 logistics professionals.



ELA offers a procedure of accreditations qualifications' system for logistics professionals, based on ELAQF Standards agreed by industry (European Logistics Association Qualifications Framework) and developed internally. This certification reflects expectations of workspace performance and it is assigned to educational institutions by performing local assessments by National Certification Centers (NCC). The basis of the certification process is the European Qualification Framework (EQF). In particular, Companies and organizations use ELA Standards as standards within organization: World Bank uses ELA Standards in the Logistics Performance Index (LPI), European Investment Bank bases call for projects on ELA Standards, United Nations sets them as deliverables on supply chain program.

There are three levels of ELA Certification:

- EJLog (European Junior Logistician), for Supervisory/Operational management level;
- ESLog (European Senior Logistician) for Senior management level;
- EMLog (European Master Logistician) for Strategic management level.

For the accreditation of programs, the bachelor/master degree programs must be accredited by quality assurance agency registered in the European Quality Assurance Register for Higher Education or by appropriate governmental agency. Also, a proof of 'fullness of logistics/supply chain content' is required: content of degree programme must cover a 70% match in at least 4 modules of ELAQF Qualification standards on relevant level (excluding Business Principles and Core Management Skills).

The ELA process for accreditation can be sum up as following: the educational institution must send in the application form available in the website and after its reception the National Certification Center or ELA verifies that institute/university is accredited. The Institute then must map curricula to ELA Standards at relevant level using the mapping file. The Accreditation is valid for 3 years, and each organization receives a proof of accreditation per program that has been accredited.

The most important benefits connected to the certification are, for organization, the availability of a marketing tool to promote and raise its international profile, while for students, a portable certificate to promote mobility in an international market place.

For the actual list of the accredited programs, we insert the link to the ELA website: <http://www.elalog.eu/accredited-programs-celog/>

6. Guidelines for PERFORMANCE

6.1. Developing of conjoint activities with business and research entities

The bridge between education and innovation can be constructed through practical activities between key actors, such as joint projects between HEIs and companies to allows students, on one hand to put into practice the concepts learned in the classroom and apply them to real problems of companies, and on the other, to help companies to find solutions.

Another solution for creating connections between education, research and business areas is to organize educational visits to company's premises: these initiatives help students both to learn how companies organize and manage the logistic processes in reality, and to see the latest technology and implemented innovations. During visits and conjoint projects, it may be possible, to develop their problem-solving capabilities through their experience in applying logistic techniques and tools (one-day problem solving workshops) and to present a further option for companies to use academic ideas from students.

Another relevant key aspects is the collaboration between the parties involved in research activities. Taking into consideration research-centered institutions, they are able to carry out joint activities not only through contract research, which is a dominant practice, with the engagement of industry's experts in their research activities through various forms of collaborations, such as short or long-term partnerships. It's very important to find the right form of formal agreement between the selected partners to provide significant benefits for the academics institution, private companies, alumni and in some cases local communities, giving also the opportunity to develop intellectual outputs combining knowledge and skills at different levels.

The networking of research institution and companies shows the support and intensification of knowledge transfer by R&S services between HEI's and the business sector through educational spin-off, start-up, and platform for open innovation, with the purpose to facilitate cooperation between partners. This implies the need of different skills such as ability, planning and communication, therefore it leads a careful selection and recruitment of graduate or PhD student that are highly motivated and with extraordinary potential in the field of logistics and supply chain management.

Additional key point of conjoint activities can be the implementation of Some HEIs *special events* (seminars, workshops or conferences) organized by the HEI's which should be open to the supply chain community, bringing a number of companies and professional organizations. Through them, in which the main participants are business experts, the projects results obtained can be presented and shared and additional

opportunities are created for networking and discussing about the latest research trends, for opening minds to new ideas, and providing new ground for research.

GOOD PRACTICE #5

NAME OF INSTITUTION: Zaragoza Logistics Center (ZLC), SPAIN

KEY POINT: *Strategic cooperation agreements with industry*

The Zaragoza Logistics Center (ZLC) is an international center for education and research in logistics and supply chain management, situated in the heart of the largest logistics park in the southwest of Europe (Plataforma Logística de Zaragoza –PLAZA), Zaragoza (capital of the autonomous region of Aragon, Spain).

So far ZLC has two strategic cooperation agreements with industry. They are signed with *Clariant* and *P&G*. After extensive interactions between ZLC and the companies in 2015 these long-term alliances are formalized. With them the scope of collaboration is extended to include applied research in cutting-edge topics as well as talent assessment, support and development. The agreement with Clariant (the first “Corporate Partner” of ZLC) is focused on two main areas: talent management and research. With regard to research, Clariant is funding a professorial chair to access pioneering results in “Supply chain oriented towards value creation” research.

Procter & Gamble (P&G) and ZLC signed a Master Collaboration Agreement. This alliance should enable the two organizations to strengthen their relationship with regard to research, education and assessment. With this Master Collaboration Agreements, P&G, ranked by Gartner as one of the two best companies in terms of supply-chain management, recognizes research centers as experts in a specific field and grants them priority status for the company’s numerous collaborative projects. ZLC now joins Virginia Tech University in the United States, and Kühne Logistics University in Germany as a benchmark center in logistics for P&G.



IMAGE 3_SOURCE:- FREEPIK

6.2. Improving offer of internships and stage in logistics

More and more frequently, the educational careers are characterized by mixed education, which includes application training modules, as well as work experience in companies, from internship to work-linked training. (Green, R.D. & Farazmand, F.A. (2012) Therefore, effective planning of the training and education system, which should consider the characteristics of the demand for training necessary for companies, is an indispensable prerequisite for the growth of each country.

Vocational training is assuming an increasingly strategic role within the production system. It responds, on the one hand, to the needs expressed by the companies; on the other, the training needs of young people who want to acquire skills for their entry into the labor market, as well as employees who want to be constantly updated and competitive, an essential and strategic condition to avoid being left behind in the labor market. The gap between the educational sector and the job environment is real due to various reasons: the lack of training facilities be-

tween school and active working life, which would enhance work experience and certification of skills. Therefore, more and more investment is needed in education and training as an essential future condition.

First of all, it is fundamental to involve external partners from the business and research fields to make agreements between the parties involved. Students will thus have the opportunity to temporarily enter the workplace, having the chance to address their professional choices and acquire certified practical experience that will enhance their curriculum. On the other side, companies can integrate their workforce, including new ideas and perspectives that can benefit the entire business reality.

The aim of internships is to put into practice what has been assimilated during the theoretical approach, enabling students to enrich their experience in the business world. On the other hand, they benefit companies too, providing knowledge and expertise which can lead to innovations and recruiting opportunities for new talents. During internships, students have the chance to focus their thesis on real-life logistics problems, working together with businesses on concrete issues with industry professionals and taking advantage of their infrastructures and information systems.

In order to follow this approach this HEIs have to stimulate the creation of stable partnerships with private organizations developing internship opportunities, formalizing agreements with them and providing tutoring and mentorship programs. Their role will be to follow the students during their placement within the company, developing their professional skills and guiding them to define their professional projects. Finally, the traineeship will end with the draft of a traineeship report on the work done in collaboration with the tutor who has followed the activity, which in addition to detailing activities carried out by the trainee, must highlight the ability of the same to integrate at a high level the theoretical skills with the ones acquired during his/her placement.

To support the internships as a part of the curriculum, a job-search website specializing in logistic positions should be implemented. The platform will attract employees who can promote jobs in logistics and for logistics professionals or students who can focus their search on an

internship or a new job in logistics. Its aim should be the promotion of logistics jobs in the largest database for logistics professionals in its territory and it should be targeted at people with practical experience and/or education in logistics and the supply chain management, announcing relevant job vacancies.

GOOD PRACTICE #6

NAME OF INSTITUTION: University of National and World Economy, BULGARIA

KEY POINT: Internship in Logistics

The University of National and World Economy (UNWE) is the largest and oldest school of economics in Bulgaria and Southeastern Europe, the leader in Bulgarian higher education.

The Department of Logistics works actively towards incorporating the practical experience in the teaching process: according to the bachelor's degree curriculum, the students are bound to complete before graduation 120 hours of internship as part-time employees in a company from the logistics or in the logistics department of a manufacturing or trading company. The goal is to reveal the application of the theoretical concepts into practice.

Business Logistics students benefit from the stable traditional relationships of the department with businesses and institutions and conduct their internships in companies such as Coca-Cola, Fresh Logic, SOMAT, LIDL, Grammer, Miltzer and Munch, Discordia, World Transport Overseas, Gopet Trans, MW Logistics, etc. In 2013 the department launched an initiative to contractually bind companies to participate in student internships.

Students benefit also from a number of already established agreements between UNWE and external organizations.

In order to support the practical training in the special disciplines, each term the Department of Logistics organizes a visit to company so that students can acquire first-hand knowledge of the logistic processes in real life. Quite often a firm is both a host and UNWE's guest to present a lecture to the students in Business Logistics.

Collaboration between education and industry is beneficial to students – it helps them to acquiring and cultivating practical skills so that they meet the labor market demands and make a proper and well-informed career choice,

which facilitates the transition into employment. Such cooperation and partnership contribute to the improvement of education's quality – through stimulating the creation of a stable partnership between the HEI and business. It should encourage the modernization of the curricula and studied subjects in line with market needs, as well as the establishment of sustainable recruitment mechanism for business.



PICTURE 3 - UNIVERSITY OF NATIONAL AND WORLD ECONOMY

6.3. Promoting thesis, Ph.D., research grants, fellowships and professorial chairs on logistics topics

An additional approach for the improvement of competences and skills in the logistics can be represented by the engagement of companies and in the Ph.D's research processes, stimulating also managers from bigger logistics companies in Europe to participate in the teaching processes.

In order to achieve excellence in research, companies should collaborate with regional educational institution and government, industry partners and leading universities worldwide in the field, with the opportunity to be involved with numerous partners around the world in its research activities and developing research projects in the field of logistics, particularly developing ad-hoc Ph.D. programs (Thune, 2010).

Providing education at Ph.D. level and similar opportunities for scientific research, allows the transfer and exchange of knowledge such as

collaborative initiatives that aim to connect scientific research and its applications in practice. The development of research communities is necessary to implement collaboration with industry, but also plays an integral part in setting national and international research agendas. Besides this, the research groups could be involved in sustainability-oriented research and education. Through collaboration with companies, they carry out research in specific sectors or implement long-term strategic projects, and they act between higher education institutions and companies, performing specialized research and offering career opportunities to researchers from specific sectors.

Additional proposal could be the establishment of annual PhD Summer Academy as a relevant initiative for internationalizing science and education, affording students and scholars from educational institution all over the globe to participate in this unique initiative conducted in dedicate period, covering advanced topics in the logistic field.



IMAGE 4_SOURCE: FREEPIK

GOOD PRACTICE #7

NAME OF INSTITUTION: Rotterdam School of Management, Erasmus University, the Netherlands

KEY POINT: PHD and Research development

Erasmus University Rotterdam is a highly ranked international research university. It has achieved remarkable national and international reputation for academic excellence, which is reflected in its position in the universities rankings.

In terms of education in logistics and supply chain management the EUR focuses mainly on ERIM, an interfaculty research school of Erasmus University Rotterdam (EUR), founded in 1998 by two schools of EUR – RSM and ESE, with over 350 researchers. The research activities are organized into 5 research programs. It is the ERIM Business Processes, Logistics & Information Systems (LIS) program which focus on innovation and optimization in the areas of logistics and supply chain management, including business operations and next generation information systems.

In 2016 ERIM's LIS research community consists of 94 researchers (34 tenured; 42 PhD candidates and 18 non-tenured). The presented data below in terms of research appointment (non-tenured/tenured/PhD candidates) shows that the number of researchers increases significantly, while there is no change in the average number of tenure-track researchers, the number of PhD candidates increases. Moreover, the number of international students has grown in the past few years²¹. The attraction of international students creates such an environment that offers various benefits: expanding international connections; enhancing knowledge through its recombination; using the advantages which can be derived from various cultures and nationalities etc.

The LIS researchers strive for academic excellence and impact by targeting their publications towards the best journals and books in management research. Since 2000 more than 835 publications are produced. In 2016, total of 74 publications were found, all except 3 of them appear in the listed ISI Web of Knowledge Journal Citation Reports (JCR) (Thomson Reuters).

LIS research program is organized into three research groups: Logistics and Supply Chain Optimization (LSCO); Operations and Innovation Management (OIM); Next Generation Information Systems (NGIS). Each of them is organized into several fields and has established research centers, attracting external funding and build bridges between academia, society and business.

The preparatory step for the dissemination activity can be identified in the evaluation of the type of event or action to perform. The selection must be performed by the teamwork and the responsible persons of the organizations involved according to the nature of the activities and the kind of outputs obtained. After that, speakers and participants must be identified and approved by the organization's structures.

It could be interesting to consider the creation of a temporary team for the event management: basically, this team would have the role of determining who will be the person/s in charge of the event creation, identifying and managing the budget assigned, supervising the progression of the activities, organizing human resources. The budget's establishment and the identification of all the costs items are essential for the event management: the engagement of sponsors between Partners or external actors from the logistic sector – such as affiliated companies, local research and educational institutions, regional or territorial authorities – could be essential from the implementation of the dissemination strategy.

These activities are closely related to what is generally called the "roadmap", which means planning the event timing. An accurate plan of activities to organize the event has to be prepared covering all the relevant aspects, (e.g. dates, locations, material to develop) that could be visualized in Gantt diagrams.

The standard dissemination events usually last half or one full day while, in case of workshops, they can be spread over several days: the duration depends by the format of the event chosen and the level of relevance of the participations of specific actors.

Another relevant aspect to consider is the communication tools, useful to promote the selected kind of event, and essential for its success. For small events or those that take place internally, it may be sufficient to inform the speakers and other eventual guests with a short presentation of the activities. Depending on the target and the type of event, different communication solutions and strategies can be adopted. In addition to the traditional ones (articles or focus sections on newspapers, journals on logistics and research topics), it is advisable to promote the events also through online channels, such as social networks, which allow to

reach the target in a user-friendly and up-to-date way, as well as through direct emailing to affiliates of the organizations involved.

In addition to general events highlighted above, it would be interested to organize other two different kind of events, which can have a relevant role in the implementation of the Knowledge Triangle in the Logistics area. Considering the good practice of Zaragoza Logistics Center (ZLC), it could be interesting to consider the so-called “Research forums”, where final students’ research projects are presented, covering a range of topics focused on logistics and supply chain management: this could spread the latest results on the field and give the opportunity to encourage sponsors to fund further developments of the presented projects. Another kind of event can be identified in “research discussions”, where companies and researchers have the opportunity to networking and discussing about the latest research trends in logistics and supply chain management applied to real life success cases. Both provide an opportunity to jointly reflect on the latest research applications in logistics and supply chain management. The main institutional members can present the latest research topics applied to real life success cases to a select number of special company partners and guests. Thus, companies and researchers can discuss and propose new ideas, trends and topics in supply chain management, find new insights and at the same time provide new ground for research in those areas.

GOOD PRACTICES #8

NAME OF INSTITUTION: Kühne Logistics University, GERMANY

KEY POINT: Dissemination of projects and event on the Logistic area

Kühne Logistics University –Wissenschaftliche Hochschule für Logistik und Unternehmensführung (KLU) is a private, state-accredited university, dedicated to providing quality degree programs for students and executive education programs for logistics professionals.

In its Master of Science degree programs KLU additionally runs a compulsory three months’ capstone project (course) throughout groups of KLU students work out solutions for practical problems offered by industry partners. A capstone project (thesis) is also a mandatory part of KLU’s part-time MBA in Leadership and Supply Chain Management. Based on a real-world

problem of importance it integrates the knowledge developed throughout the program and provides the student with a transition from theory to actual practice.

In addition to these regular study program elements, KLU organizes a variety of extra-curricular events connecting university, research and industry on a yearly basis.

With the “KLU Boot Camp” 40 chosen bachelor students from all over Europe once a year get the opportunity to discover new ways of scientific thinking and problem solving in the field of digital transformation under supervision of KLU’s expert professors. At the same time, they have the chance to work on real world-cases, presented by companies such as Lufthansa Technik Logistics Services, Kühne + Nagel and DPD Deutschland (2017). The three-day workshop thus combines academic and industry perspectives on certain topics and enables students to create solutions derived from scientific knowhow for real issues.

Klu’s logistics start-up Day brings together KLU students, professors and start-ups from the area of transportation and logistics. In the 2017 during the premiere event, 150 participants had the chance to learn from and interact with some of the current movers and shakers within the logistic and transportation industries. 15 innovative companies (such as Flexport, FreightHub, Moovel or Seven Senders) presented their business models in talks and interactive in-depth discussions and thus provided a hands-on lesson in entrepreneurship.



PICTURE 4 - KÜHNE LOGISTICS UNIVERSITY

7. Guidelines for CHECK and ACT

7.1. Analyzing progress and reviewing active conjoint activities

The planning of the coordinated activities proposed in the previous Guidelines should always imply the ongoing and final review of their execution, to guarantee the efficiency and effectiveness of the strategy behind them.

The most indicated audit activities that are advisable to perform are physical or online meetings between the involved stakeholders, that can be scheduled, according to the length of the activity performed, in one or more ongoing meetings to concretely analyze the contingents' problems and find possible solutions, and a final one to evaluate the overall performance.

Throughout the meetings different aspects should be analyzed such as the progress made and those still to be implemented, the strength and weakness emerged, and the efficacy of the tools used to achieve the final results. This should allow us the monitoring of the activities carried out, evaluating the benefits and potential gaps found during the review analysis. Moreover, if the gaps cannot be filled with the available resources, the review activity could help to identify the need of recruitment of new stakeholder to increase the selected staff and, in this way, improve the chances to obtain the expected results.

To better perform these evaluative analyzes, it is advisable to identify a responsible person within the teamwork, who will be in charge of the organization of those periodical meetings. The main tasks that should be covered by the responsible person can be identified in all those activities that regard the meeting management, from the selection of dates, the communication to the stakeholders of reminders, agendas and possible variations, to the creation of final reports to highlight the discussions done and decisions approved.

Finally, the final disclosure of the review activities to the external stakeholder of the evaluation and control activities carried out is recommended. This should help, first, to assure the quality of the processes implemented in the management of the coordinated actions, secondly, to help future users to get information on the tools which have been used and on future results they expect to achieve.



IMAGE 6_SOURCE: FREEPIK

7.2. Engagement of new potential stakeholders

The effective implementation of an efficient Knowledge Triangle, should include a periodical review of the potential stakeholders of all the organizations already connected in processes of knowledge creation for Logistic activities. The analysis of the stakeholders of the Triangle actors performed in different times over the months/years of active collaboration, could identify new potential organizations that could be reached and, related to this, new possible paths for the further growth.

The first step should be the stakeholders' identification (Eden & Ackermann, 1998) and the analysis of their role in the creation of knowledge in the Triangle framework in Logistics. In particular, stakeholders from the business could be involved for their potential support in the development of market-oriented educational activities (e.g. internships, thesis, PhDs, scholarships, fellowships, funds etc.) as well as for research ones, focused on the Logistic field. It can be useful to identify the way in which stakeholders can be influenced or influence the already involved organization, as well as their attitude towards their missions and the activities' targets.

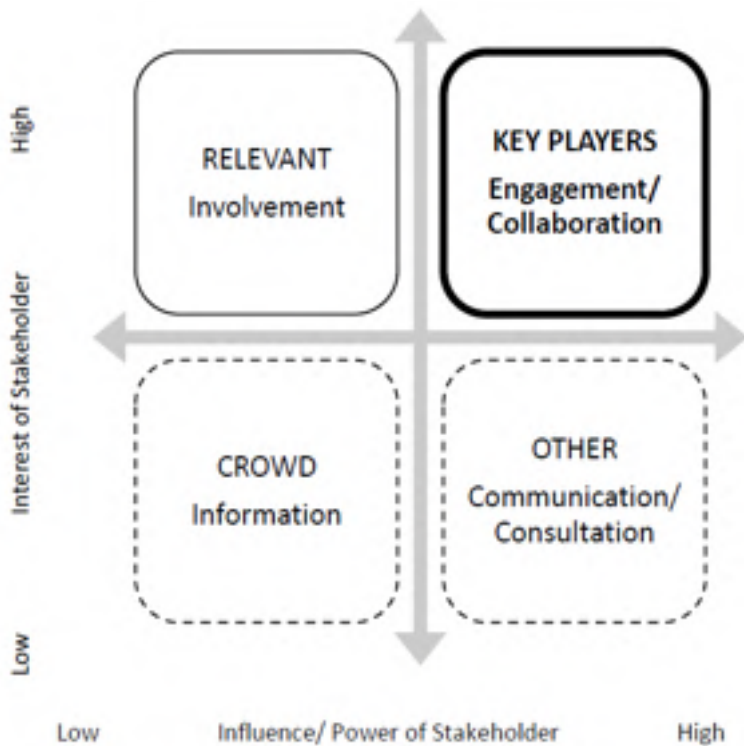


FIG. 7 - POWER INTEREST GRID APPLIED TO FRAMELOG KNOWLEDGE TRIANGLE
SOURCE: ELABORATION FROM GRID OF AKERMANN (EDEN &ACKERMANN, 1998)

A useful tool should be the creation of a Stakeholder Engagement Plan (ALTRIA, 2004) which is considered as a fundamental instrument used by organizations to engage relevant stakeholders. Since “engagement” means building relationships through different partners, different communication methods are potentially usable to engage stakeholders and the selection is guided by the identification of the target audience as a fundamental step. The Stakeholder Engagement Plan helps to reinforce strong and long-sighted communication with already structured stakeholders, as well to allow the development of new collaborations with additional ones, who could be useful for achieving

our future goals. In fact, a very high strength of Stakeholder Engagement Plan can be identified in the opportunity of successful project delivery, based on the development of relationships: where people feel involved and connected to the same vision, the activity flows easily and effectively, increasing confidence across the project environment.

The stakeholder engagement not necessary implies a long-term relationship with active involvement among the subjects but could also consider, at the first step as temporary collaboration to assess the new actors, with higher tasks to be assigned in the development. The relevance of a constant analysis of new possible collaboration consists in the opportunities that only external actors can present, giving new ideas and proposal to the fundamental group. Also, it is advisable to focus the engagement of European actors which can be corresponding to the already present organizations' structure and statute, considering the importance of foreign countries experiences that can change the usual perspective of problem-solving and giving new hints for a constantly innovative process of knowledge creation in Logistics.

8. Conclusions

The present guidelines evidences that as the Logistics and Supply Chain Management areas are constantly evolving, an efficient and "knowledge creation-oriented" framework of interactions among the key actors can enable the definition of a didactic offer increasingly aligned to business' requirements, the creation of an effective recruiting system to connect students, workers and companies, and lay the foundations for joint research activities and scientific production for its proactive improvement.

The systemic view offered by these Guidelines also clarifies that the efficient implementation of an effective Knowledge Triangle in the Logistics area simultaneously needs strategies and actions of the three fundamental actors, which represent the educational level, the research field and the business reality (High Educational Institutions, Research organizations and Companies). The perspective is shown in Figure 5, where knowledge creation processes are represented (as spirals), necessary to constantly improve the development of competences and skills in the Logistics and Supply Chain Management Triangle.

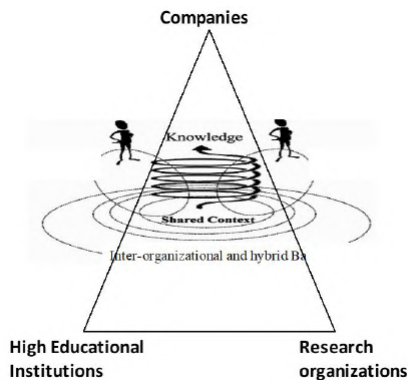


FIG. 8 - KNOWLEDGE CREATION IN HYBRID INTER-ORGANIZATIONAL BA WITHIN THE LOGISTIC TRIANGLE
SOURCE: ELABORATION FROM NONAKA, TOYAMA, KONNO, 2000: 14

Looking at the knowledge triangle with the lens of these guidelines, emerges that the efficiency and the effectiveness of the knowledge exchanges improve when the key actors activate solutions of strategic and structural hybridization of their competences and knowledge. It is possible to say that solutions proposed in the guidelines get closer and hybridize the vertices of the knowledge triangle, as shown in the following Figure.

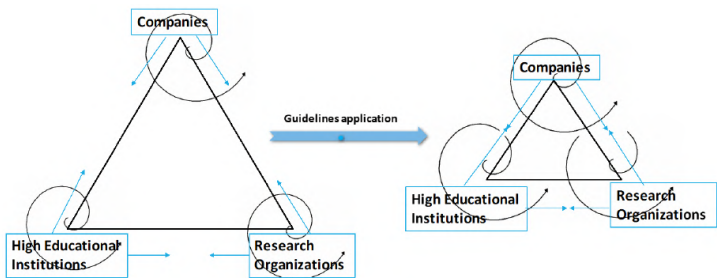


FIG. 9 - PROCESS OF MUTUAL RAPPROCHEMENT AND HYBRIDIZATION BETWEEN THE TRIANGLE'S VERTICES AND QUALITY IMPROVEMENT OF THE KNOWLEDGE CREATION TROUGH THE GUIDELINES APPLICATION
SOURCE: ELABORATION OF THE AUTHORS

As pointed out in many of the previous guidelines, there are also of the other key actors that are crucial to activate high-impact knowledge applied solutions and actions that are able to constantly enhance the quality of the knowledge creation processes within the triangle, or better within the local knowledge “triangles”, especially through some hybridising mechanisms of knowledge sharing among the same actors. These processes are shown in the following Figure 7, using the well-known Nonaka and Konno’s framework of “Ba”, considered a “shared space representing a foundation for knowledge creation: a platform for advancing individual and organizational knowledge” (Bartolacci et al., 2016).

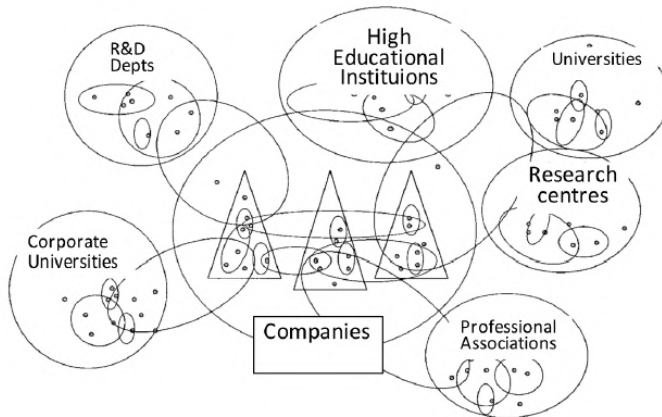


FIG. 10 - KNOWLEDGE CIRCULATION BETWEEN THE TRIANGLE'S CORNERSTONES AND KEY ACTORS

SOURCE: ELABORATION OF THE AUTHORS FROM NONAKA, & KONNO, 2003: 8

The actors included are the Universities, which perform both educational and research activities; Corporate Universities, organization funded by businessmen to develop academic courses strongly oriented to the market, that are positioned in the connection between education and companies; Research and Development Departments, whose core activity is the implementation of research projects tailored on companies' operational requirements, and Professional As-

sociations, which, depending on the statute, might be able to perform both educational and research activities in a strong relation with the business organizations associated. Particularly it is clear how necessary is to increase the collaboration between university and companies to reduce the big gap between the knowledge level in the logistic area and education.

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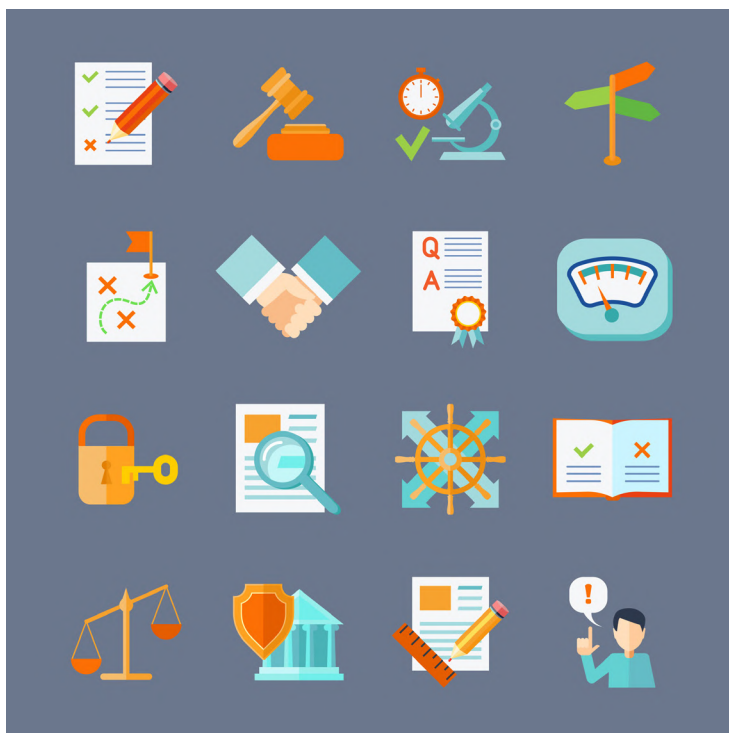
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MAPPING THE CHALLENGES: IMPLEMENTING THE FRAMELOG IN THE FIELD OF QUALITY ASSURANCE AND ASSESSMENT

*Mario Spatafora, Ana Maria Cotovanu, Federica D'Acunto
Finance & Banking – Associazione per lo sviluppo organizzativo
e delle risorse umane*



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1. Introduction

The aim of this activity is to define the real challenges the key players of the Knowledge Triangle (HEIs, businesses and research institutes) might encounter when implementing the FRAMELOG, with a specific focus on the quality assurance and assessment. Particular attention will be given to the HEI's perspective, considering their role of knowledge transfer dissemination within the triangle.

During the needs' analysis conducted for the preparation of the project proposal, Partners have already identified some specific challenges to be addressed:

- Learning needs analysis which takes into due consideration the demands of the logistic area
- Relevance of academic offer for research and for the labour market
- Course development and delivery with active involvement of the business sector
- Assessment and validation of skills and competences (acquired in formal, non-formal and informal contexts)
- Stakeholders' engagement (identification/selection, involvement, procedures, feedback loops between HEIs, business and research)

Moreover, during the previous project activities (in particular in O2) additional challenges have been identified:

Embedding industry experts as teachers and/or lecturers into educational courses;

Developing conjoint activities with business and research entities (e.g. educational visits to company's premises, organization of HEIs special events (seminars, workshops or conferences) with the involvement of business and research from the sector (short or long-term partnerships between research and business, etc.);

- Improving offer of internships and stages in logistics;
- Promoting thesis, Ph.D., research grants, fellowships and professorial chairs on logistics topics;

- Disseminating outputs regarding logistic projects' progress and results (e.g. online publications and public events for a wider diffusion, seminars, focus groups) academic thesis.

However, in order to better define these challenges, it is important to fully understand the contents of the 'European framework for 'Knowledge Triangle' in the logistics sector' (FRAMELOG) that have been defined through previous activities (O2):

- a. Seven key players in the Knowledge Triangle approach have been identified: HEIs - Higher Education Institutions, Company, Research Institution, University, Corporate University, Professional Associations and Research and Development Departments within companies.
- b. Partners defined specific criteria and indicators to be considered when analysing the level of implementation of FRAMELOG (O2-A1), using the Plan-Do-Check-Act cycle pattern. This tool is based on the roles of the key players in the Knowledge Triangle process and on the identification of those potential common points between the different players. Furthermore, Partners used the Plan-Do-Check-Act cycle pattern. Based also on the good practices collected for the Compendium of Good Practices (O1), Partners defined questions that enable the assessment of organization's current situation regarding the implementation of the FRAMELOG.
- c. Furthermore, Partners defined specific methods, instruments and related actions that can be used to achieve a higher level of collaboration between the Knowledge Triangle (O2-A2) once the self-assessment has been completed.
- d. In addition, Partners developed the Stakeholder Engagement Plan (O2-A3) aimed at defining communication strategies to engage and maintain relations with the potential key stakeholders of the Knowledge Triangle applied in Logistics.
- e. Ultimately, Partners provided practical guidelines for the effective implementation of the FRAMELOG (O2-A4). These Guidelines provide clear indications regarding the way HEIs can define organizational structures, design courses and training programmes, obtain relevant accreditation for courses, engage experts from the business

sector in educational programmes, promote relevant activities necessary to implement an effective knowledge sharing approach in the logistic area. Moreover, in order to concretely support the logistics actors involved, every proposed action or process is accompanied by a pragmatic case study chosen around Europe as good practice in the specific aspect taken to consideration.

2. Methodology

In order to finally identify the most relevant challenges to be addressed in terms of Quality Assurance, Partners considered the results of the preliminary analysis previously presented, and based on these, they implemented the following research activities:

- a. Collection of existing good practices and analysis of the difference experiences in the logistics and supply chain management area.
- b. Considering the identified good practices, they conducted further desk research analysis for better understanding the weak points that organizations have the moment they try to implement the 'Knowledge Triangle' approach (FRAMELOG).

Based on these two main actions and considering the contents of the Framework, Partners listed several challenges they considered relevant and after open discussions within the Consortium, they made a decision of the final list of challenges the project should address.

The development of these challenges' list also stands on two European Quality systems for education ("European Standards and Guidelines", hereinafter also ESG, and The European Quality Assurance in Vocational Education and Training", hereinafter also EQAVET) and on the PDCA Quality model (Deeming cycle). ESG and EQAVET are respectively the two European Quality Assurance Frameworks for Higher Education and for Vocational Education and Training.

The Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG) were adopted by the National Ministers of higher education in 2015 following a proposal prepared by the European Association for Quality Assurance in Higher Education (ENQA) in cooperation with some other organizations.

The ESG are aimed at promoting a common understanding of the Quality Assurance systems in the Higher Education Area for enhancing transnational cooperation and assuring the development of a European unique system. Engagement with quality assurance processes, in fact, improves transparency mechanisms and encourages mutual trust and better recognition of their qualifications and programmes within HEIs.

The European Quality Assurance in Vocational Education and Training (EQAVET) is the reference Framework addressing VET Providers and designed to offer a set of Indicators and tools for the implementation, monitoring and improvement of Quality Assurance systems. The 10 EQAVET Indicators are aimed at increasing transparency of qualifications and mobility of workers and students, facilitating the bridging process between general education and higher education and addressing the gap between labour market needs and labour force qualifications.

Both ESG and EQAVET refer to Quality Assurance as a continuous improvement cycle as a precondition for the development of a 'culture of Quality Assurance'. As a consequence, the following list of challenges relies on the PDCA cycle, also known as Deming wheel, which refers to Quality Assurance for education and training, as a 'cycle' based on the following steps: Plan (Define goals and objectives); Do (Establish the procedure to ensure the achievement of settled goals); Check (Collect processing data and discuss the results); Act (Apply feedbacks and procedures for change).

The specific meaning of each of the PDCA process has already been defined in the Output 2. In particular, the "Plan" phase includes the core planning activities of an academic course, meaning a variety of activities that goes from the selection of contents of the course, through the choice of the most effective educational method, to the identification of the knowledge and of the core competences that will be gained by the students and to the planning of the support structure of the activities; the "Do" phase represents the actual teaching delivery within HEIs; the "Check" phase represents the results' control of the previous phases; the "Act" phase regards the actions to be taken for enhancing the collaboration between the three points of the Knowledge Triangle.

Moreover, for this particular Output Partners will also consider the meaning of PDCA in relation to the quality managements systems. In this regard, the four stages represent the steps to be taken for setting up quality systems: Plan – define the Quality Plan engaging key stakeholders; DO – implement the specific activities for guaranteeing quality of services/products through customized quality tools and instruments; Check – analyse the efficiency of the quality objectives and tools implemented; Act – apply improvement measures for enhancing the quality system.

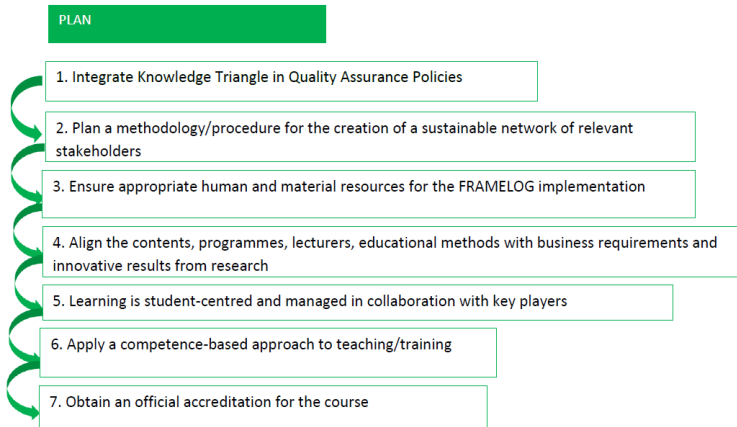
Such a map of identified challenges on Quality Assurance and Assessment for the implementation of the FRAMELOG will represent the basis for the development of a set of practical Guidelines addressed to the main key players of the Knowledge Triangle (HEIs, business and research) aimed at concretely supporting them in overcoming such challenges.

3. Challenges in implementing the FRAMELOG

This list is organized following the PDCA cycle, the same framework that has been used throughout the whole project activity. The meaning of every PDCA process has already been defined in O2, as summarized in the previous chapter.

Furthermore, the challenges take into account both the contents elaborated in the development of the FRAMELOG and the specific QA descriptors as they are defined by the EQAVET approach (<https://www.eqavet.eu/EU-Quality-Assurance/For-VET-System/Eqavetplus/EQA-VET-Approach>).

3.1. *Challenges in the Plan phase*



1. Integrate Knowledge Triangle in Quality Assurance Policies and QA Culture

All HEIs that have official recognition have in place a kind of Quality Assurance Management System since they are periodically monitored by the specific national/regional public bodies in the Member States. Moreover, they also have some European based QA standards that are invited to follow (e.g. ESG).

In addition, considering the results of the project previous activities, it was noticed that there are many HEIs active and/or interested to become more active in the implementation of the Knowledge Triangle.

However, the main difficulties HEIs have to deal with are related to the following aspects:

- Definition and implementation of QA with a systemic approach
- Spread of the quality culture and QA implementation at all levels within the organizations.
- Active involvement of HEIs governance and of the different actors of the Knowledge Triangle (business and research). This difficulty is rather common for the logistics and supply chain management area.
- Definition and implementation of the common points between QA and the Knowledge Triangle.

2. Plan a methodology/procedure for the creation of a sustainable network of relevant stakeholders

Although most of the HEIs structurally cooperate with external players (in particular with the business sector and research institutions), not all of them are used to have a concrete ‘Stakeholders’ Engagement Plan’ for facilitating the stakeholders’ (such as: guest professors, researchers, business professionals from the logistic and supply chain management area in particular) identification, attraction, participation in the academic activities to support students’ life (e.g. curriculum design, internships, theses, PhDs, scholarships, fellowships, funds etc.) and career (e.g. joint working transition plan and career preparation plan).

3. Ensure appropriate human (specialized, updated and trained staff) and material resources (facilities, infrastructures and technologies) for the FRAMELOG implementation

The “FRAMELOG” project core intention is based on the co-creation and co-management of the Knowledge Triangle in the logistic area, developing the collaboration between the actors involved. Therefore, also the organizational resources, in terms of lecturers, technical equipment, locations, etc. should be shared among the key players. However, this is a challenge in most academic contexts and leads to difficulties in innovating academic education. In addition, in this context the challenge is even wider since it is based also on the difficulty that HEIs have in guaranteeing the responsibility and accountability of the resources involved (internal and external). For example, in many cases HEI’s still have a rather ‘traditional’ structure, and although they are taking actions to modernize it for turning it into a more ‘cooperative’ structure, there is still room for improvement.

4. Align the contents, programmes, lecturers, educational methods with business requirements and innovative results from research

Despite the active collaborations among the different Knowledge Triangle players, it is still necessary to underline the fact that this co-operation does not always lead to concrete impact on the course contents and programmes development, identification of the most effective

teaching methods or on the involvement of teaching experts in the delivery phase.

In most of the cases, the different collaborative actions are limited to specific events and/or training phases without guaranteeing a comprehensive implementation and impact on the actual connection of the academic offer to the labour market needs and trends and to the research innovations.

5. Learning is student-centred and managed in collaboration with key players

The student-centred approach is very much supported by European, national and regional educational policy goals since it is considered to be of high relevance in guaranteeing the quality of education and training.

Although there are many examples of HEIs which implement this approach, it is still difficult sometimes to focus on what students really need in terms of knowledge, skills and competences to develop for their future professional career. This difficulty is mainly due to the limited communication between HEIs and students and external players (research, business, community etc.) from the logistics and supply chain management area. Moreover, managing learning with a student-centred approach in collaboration with key players implies more complexity in planning and organising learning activities, since it requires an active engagement of all parties and, at the same time, individual approach in the learning process.

6. Apply a competence-based approach to teaching/training

During the different research activities conducted by the Consortium, it was noticed that the HEIs that provided specific case studies were engaged in improvement processes that involve the integration of competence-based approach in the academic offer and professional training, especially in the technical faculties, including the logistic and supply chain management area. In particular, this competence-based approach implies strong consideration of business requirements.

However, not all HEIs are active in implementing a competence-based approach in their educational programmes. Moreover, those HEIs that demonstrated to be engaged in applying this approach don't always manage to guarantee a systemic implementation and do not always refer to all stages of education (e.g. curriculum design, content development, teaching methods, delivery approaches and materials etc.).

For example, it was still noticed a mismatch between academic assessment methods/tools (prevalently based on the assessment of acquired knowledge with tools such as questionnaires) and working assessment methods/tools (prevalently based on the resolution of problems and, hence, on the assessment of acquired competences).

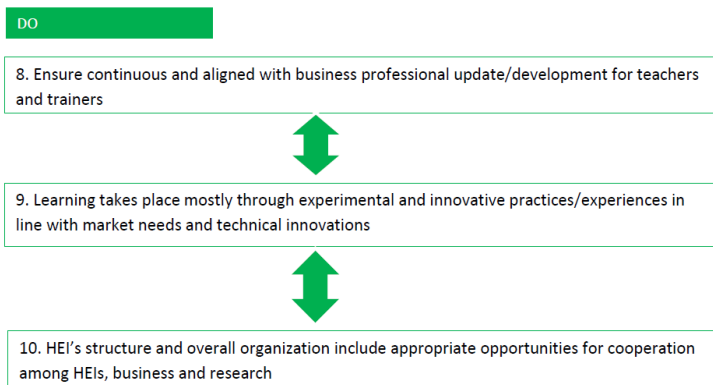
7. Obtain an official accreditation for the course

Although most of HEIs are accredited for their academic courses, it has been noticed that this is not very common for the professional training courses in the field of logistics and supply chain management area.

Having an accreditation for a specific professional training course might sometimes be difficult and generally it requires time and resources. In addition, in some Members States it is not easy to choose the most valuable accreditation to obtain as there are more than one accrediting bodies. In addition, based on national/regional legal requirements, professional qualifications can be accredited by public institutions (e.g. Ministry of Labour) and/or private institutions (e.g. professional bodies).

Furthermore, not all HEIs are aware that, for example, in the logistics and supply chain management field, there is also the opportunity to obtain a specific European accreditation.

3.2. *Challenges in the Do phase*



8. Ensure continuous and aligned with business professional update/development for teachers and trainers

In each country there are different national based requirements regarding the professional background and professional development of teachers and trainers. Such a continuous training is also recommended and encouraged at European level (e.g. ESG and EQAVET Frameworks and Erasmus+ Mobility for teachers).

However, the continuous professional development of teachers and trainers is not always easy to guarantee and to monitor. In most of the cases HEIs don't manage to support (with financial resources) and to manage teachers and trainers' professional update. This challenge is due to the limited resources HEIs have at their disposal, to the internal organizational structure and also to the difficulty to guarantee continuous contact and collaboration with the business environment.

9. Learning takes place mostly through experimental and innovative practices/experiences in line with market needs and technical innovations

Most of HEIs are quite active in providing their students with the possibility to actually 'touch' and/or 'experiment' what they learn. Espe-

cially technical universities are quite well organized from this perspective. However, it is demonstrated at EU level that it is necessary to bring relevant improvements in this field in order to achieve Europe 2020 objectives in the field of education and training.

This challenge must be interpreted in two ways which are anyway linked one another:

- a. during the initial Project research, it has been noticed that, in order to comply with the present labour market needs and with the rapid technological innovations in the logistics and supply chain management area, it is necessary to enhance this capacity of HEIs. As a result, it is necessary to develop more practical instruments for facilitating learning (laboratories, demonstrators, experiments, simulations etc.);
- b. in order to make sure that these practical learning activities are really relevant for the labour market, it is necessary to design and deliver them with the involvement of business sector and research as well.

10. HEI's structure and overall organization include appropriate opportunities for cooperation among HEIs, business and research

When it comes to actually delivery education, HEIs are still having difficulties in cooperating with external stakeholders. In many cases, they fail to manage efficiently the organization of learning activities that involve business representatives and researchers as well. In many cases, it is mainly due to the lack of information, communication and trust among the different players. But in some other cases, it might be also because of institution's and student's limited financial resources.

3.3. *Challenges in the Check phase*

CHECK

11. Develop longitudinal graduate tracking system: conduct effective joint data collection and analysis



12. Apply feedback loops mechanisms among the three sides of the 'Knowledge Triangle'

11. Develop longitudinal graduate tracking system: conducting effective joint data collection and analysis (e.g. market needs, unemployment rates, completion and placement rates)

With reference to Quality Assurance systems and particularly to Check phase, the graduate tracking system represents a priority in Europe (New Agenda for Skills, 2016) as the collection of several data can support the improvement of the Higher Education system itself. However, not only do HEIs face difficulties in collecting and comparing very different data, but in some cases, they also do not apply appropriate tools and evaluation methodologies for collecting and interpreting relevant data.

Moreover, the collected data are not always used for strategic planning and improving HEIs educational offer.

The development of a longitudinal tracking system could instead enhance Universities' capacity of guaranteeing the quality and relevance of the training programmes, in line with students' and Knowledge Triangle actors' actual needs and challenges.

As a consequence, such a system would ensure joint cooperation of key Knowledge Triangle actors and increase data comparability among countries.

12. Apply feedback loops mechanisms among the three sides of the 'Knowledge Triangle' (University, Research and Business)

As the Knowledge Triangle is mainly based on the cooperation between HEIs, Business and Research, such a collaboration should be applied not only for developing new programmes, contents and activities, but also to customize and correctly implement cooperation procedures and trends throughout all the education phases and beyond.

In particular, organizations (HEIs, Research institutions and business sector) register difficulties in maintaining active their collaboration also after the end of the education/training activities. During this phase they could have the opportunity to communicate information about the relevance of education/training, the actual implementation of competences built during the education/training activities, future needs and trends. Although all these organizations are aware of the relevance this stage has on the Knowledge Triangle implementation and on the overall quality of the education and training, they are still facing difficulties in improving their cooperation and communication in this regard.

3.4. Challenges in the Act phase

13. Periodically improve/update academic programmes (contents, delivery methods and stakeholders involved) and activities based on evaluation results and new market needs.

As quality assurance is a continuous process, once the 'check' phase has produced some results, the Quality cycle promotes the transformation of these results into inputs for the improvement and update of HEIs' programmes and activities.

Students' feedback and market analysis collected through different evaluation systems (graduate tracking system and feedback loops, for instance) provide a precious set of data that need to be read and interpreted from an innovative perspective.

However, although HEIs are aware of the relevance of valorising evaluation results for enhancing their educational offer, it was demonstrated that this process of improvement is not always inclusive enough. In most of the cases research and business representatives are not engaged with an active role in this stage and HEIs are mainly focused on

the update of academic curriculum, activities and contents, and less on the cooperation with external key players.

4. Conclusions

The Education and Professional Training sector (ET) is undergoing major changes that lead to the need to address challenges of different types and coming from diverse stakeholders.

The implementation of Knowledge Triangle in the daily academic education and training, in particular for the logistic and supply chain management area, is one of these challenges and all key players are invited to take their responsibilities in this process of change.

The “FRAMELOG” project Outputs include the description of the key stakeholders and indicate also their roles and responsibilities for guaranteeing the efficient implementation of the framework. However, the changes proposed are not always easy to implement mainly because of several specific factors:

- a. Academic education and training in all sectors still has a so-called ‘traditional’ structure that faces limitations with regards to internal quality assurance systems in line with the European recommendations.
- b. ET is becoming more and more a collaborative environment of knowledge sharing, co-research and co-working approaches and not all HEIs are ready to provide this type of education and training (mainly due to their organizational structure).
- c. Knowledge Triangle players are quite many (in developing the FRAMELOG, Partners identified seven relevant players), with different organizational structures and objectives.

Due to these factors, Partners identified some specific challenges that might need to be addressed when implementing the FRAMELOG by the key players, in particular by HEIs.

These possible difficulties, that may occur during the entire Quality Assurance cycle: the Plan-Do-Check-Act pattern involves all the key players and can be addressed efficiently only with active cooperation among them, according to their specific role and expertise.

GUIDELINES FOR HEIS FOR ENHANCING QUALITY ASSURANCE AND ASSESSMENT STRATEGIES IN LINE WITH FRAMELOG

*Mario Spatafora, Ana Maria Cotovanu, Federica D'Acunto
Finance & Banking – Associazione per lo sviluppo organizzativo
e delle risorse umane*



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1. Introduction

The FRAMELOG project aims to contribute strongly to enhancing cooperation between higher education, research and business in the logistics sector, by incorporating European recommendations in the field of higher education, lifelong learning and work-based learning methodologies.

To reach this aim, Partners already developed a Compendium that includes concrete examples of good practices related to the successful implementation of the Knowledge Triangle in the logistics and supply chain management area in particular.

Based on these good practices, Partners defined what will be nominated as 'FRAMELOG' – a specific Framework for implementing the Knowledge Triangle in the chosen area. This Framework includes as series of instruments and tools:

- a. Specific criteria and indicators for the knowledge triangle through an online self-assessment tool addressed to Higher Education Institutions (HEIs)
- b. Methods and instruments for enhancing the communication among HEIs, Research Institutions and industry
- c. Stakeholders' Engagement Plan that explains who should be involved in the knowledge triangle, in which manner, with which objectives.
- d. Guidelines for efficient implementation of Framework

Considering FRAMELOG, the following Guidelines are aimed at giving concrete support, in particular to HEIs, on the implementation of Quality Assurance and Assessment strategies in line with The Framework developed within the Logistics and Supply Chain Management area.

Based on the Challenges mapped in O3-A1 and classified in four main phases according to the Deming Cycle (PLAN, DO, CHECK, ACT), the Consortium has developed the most relevant guidelines with relative examples and explanations to support their application.

A step-by-step approach will direct HEIs in easily identify the most effective solution for solving FRAMELOG's challenges and for improving the Institute's system of Quality Assurance and Assessment through enhanced cooperation between HEIs, Companies and Research Centres.

2. Quality Assurance and Assessment within the FRAMELOG

The 'Knowledge Triangle' approach refers to the need to establish solid cooperation strategies between the three main actors which are involved into the innovation process: Higher Education Institutions, Business and Research. Such an approach, in fact, can guarantee the enhancement of transparency and mutual trust mechanisms that positively affect not only the Quality of Higher Education, but also the labour market's access and competitiveness as well as its innovation.

In particular, the relevance of assuring and assessing Quality of education in the area of Logistics and Supply Chain Management is urgently required by the challenges deriving from the technological innovations and customers' behaviour. Within this evolution process, FRAMELOG developed by the project emphasizes the need to guarantee high level of Quality Assurance as a necessary precondition for the effective implementation of the Framework.

Quality Assurance and Assessment, in fact, applied to 'Knowledge Triangle' in the Logistics and supply chain management area lead to:

- the increase of interactions between all the actors of the Triangle
- the awareness of being involved into a commonly shared framework
- the heterogeneity of approaches that improve the level of Quality Assurance and Assessment systems adopted in the Logistics and supply chain management area
- bridging the gaps between strategies and goals within the educational, research and labour market
- the practice of Quality Assurance and Assessment mechanisms within the Logistics and supply chain management area.

In this sense, the following guidelines provide a map for Higher Education Institutes to effectively apply and improve their Quality Assurance and Assessment systems within different aspects of HEIs' life (e.g. curriculum design, staff recruitment, delivery methods, assessment, etc.), through a comprehensive approach aimed at rapidly responding to changing educational, working, research needs of Logistics and Supply Chain Management.

3. Guidelines implementation

For each challenge identified in O3A1 we provide practical guidelines

3.1. Guidelines for the challenges identified in the PLANNING phase

Challenge 1: Integrate the Knowledge Triangle in Quality Assurance Policies and QA Culture

Guidelines

A. Include Quality Assurance in the HEIs, Business and Research Institutes' strategic objectives and vision

In order for an organization to build a strong quality assurance culture, it is necessary that the organization's scope and policy at macro level include clear indications to it.

Therefore, for guaranteeing the quality of their educational activities, HEIs, companies and research organizations are expected to make direct reference to Quality Assurance when defining their strategic objectives and the vision.

Practical guidance:

- Define a Policy Statement including Quality Assurance as key principle in the core values and Vision of the organization (e.g. refer to: 'quality education', 'education relevant for the labour market')
- Develop an Organizational Chart, a diagram that illustrates the structure of the organization and the relationships and relative ranks of its parts and positions/jobs (often called organigram). In this chart it is important to integrate the quality process as well
- Define Strategic objectives, that represent intermediary and incremental advances within the overall strategic plan in reaching the strategic goal regarding the implementation of quality education
- Define Quality objectives that aim at guaranteeing the conformity to requirements, at facilitating the effective deployment and improvement of the quality management system (QMS) at organizational level

Example:

Define your own supply chain(s) in conjunction with your industry partners. Include supporting partners in HEIs and research institutions that provide educational and consultancy services. These partners can contribute to the efficient management of knowledge flows in the supply chain.

B. Engage HEIs governing bodies in the definition and concrete implementation for the QA within FRAMELOG

In order to build a culture of quality for the educational programmes provided by HEIs, it is necessary to guarantee the actual involvement of the governing bodies in the definition and implementation of Quality Assurance within FRAMELOG.

It is highly relevant that quality is shared by the top management and further disseminated to the organizations' staff at all levels.

Practical guidance:

- The Top Management is aware of the QA principles and opportunities and support quality implementation within FRAMELOG
- Governing bodies provide actual support for ensuring the quality of educational offer in line with FRAMELOG (e.g. provide necessary resources, disseminate quality principles, collect feedback from key stakeholders, etc.)
- Quality is being monitored periodically by the top management and continuous improvement is guaranteed

Example:

Describe the value of a culture of continuous improvement within supply chain and other organisations.

C. Develop joint Quality Assurance procedures and tools within FRAMELOG

The key focus of FRAMELOG is the 'cooperation' among the relevant actors: HEIs, companies from the logistics and supply management

area and research institutions. Therefore, this cooperation is expected to be not only a general agreement, but also a practical approach to ensure the quality and relevance of the educational programmes.

After having defined the quality objectives and strategies, it is important that HEIs engage also the other players in defining and implementing concrete quality processes.

Practical guidance:

- For each quality objective define specific performance indicators, implementation procedures and tools, taking into consideration also the quality standards implemented by the other players (business and research)
- When defining the specific procedures and tools, indicate also the role of the other players and how they should be involved in the precise quality activity
- Based on the feedback received from the business and research institutions, continuously update and improve the quality procedures and tools in order to be in line with their quality requirements

Example:

Benchmark your organisation and learn through good practice; set up a benchmarking club encompassing the wider FRAMELOG participants.

*Challenge 2: Plan a methodology/procedure for the creation of a sustainable network of relevant stakeholders_*

Guidelines:

A. Develop and maintain a sustainable network of stakeholders to be engaged in FRAMELOG

Specific recommendations for setting up a Stakeholders' Engagement Plan have been provided in O2 A3. This guideline is mainly referred to 'how to ensure the sustainability of the network'.

Formal agreements between HEIs and business and research represent one of the key principles of the FRAMELOG. In order to guar-

antee quality and relevance of the educational programmes, it is highly important that this collaboration is a ‘long lasting’ practice rather than ‘on the spot’ action.

Practical guidance:

- Define specific objectives and indicators for the involvement of stakeholders into QA of the HEIs and the offered educational programmes (e.g. in which quality areas and to what extent the different stakeholders should be involved, how many of them, typology of stakeholders, impact envisaged on the educational programme, etc.)
- Continuously monitor the state of art concerning the involvement of stakeholders into QA of the HEIs within FRAMELOG
- Implement appropriate measures for ensuring long collaborations with stakeholders (e.g. based on their feedback, adjust the educational programmes, the collaboration processes, etc.)
- Promote collaborations (e.g. through website, dissemination materials – leaflets, publications, etc., public presentations, etc.) and their results internally and to wider public in order to ensure visibility and recognition
- Use the FRAMELOG Case Studies of Good Practice to help identify, build and sustain a network of stakeholders.

Example:

The Novus trust link with the University of Huddersfield, a partnership between major companies across a wide range of business sectors that recognise the need to reinvent the way in which the supply chain profession finds and prepares its future leaders (www.novus.uk.com).

B. Organize periodical events for sharing educational results achieved within FRAMELOG

Since FRAMELOG is based on the principle of ‘cooperation’ for ensuring higher quality and relevance of the educational programmes provides by HEIs in the logistics and supply chain management area, the

organization of periodical events represents a key recommendation for supporting the actual implementation of FRAMELOG.

When and which type of events should be organized, depends mostly on the specific context and requirements, such as: lessons and assessment calendar, availability of key players, trends and innovations in the logistics and supply chain management area, etc.

Practical guidance:

- Agree (together with the key players) an Annual Plan for events, indicating: type of event, objectives of the event, targeted audience (qualitative and quantitative indications), venue and date, marketing strategy
- Engage companies and research institutions in the organization of each event, based on their specific professional profile, interests and availability
- Promote these events and stakeholders' involvement widely, in order to give visibility and recognition at local, national and international level
- Assess the results of these events (through questionnaires, interviews) against the envisaged objectives and take measures for further improvements
- Disseminate the positive results achieved through these events with the objective to motivate stakeholders to support these type of cooperation activities.

Example:

Together with key stakeholders, organise an event as part of the annual 'European Supply Chain Day' to raise awareness of the value of logistics and supply chain activities in people's everyday lives (www.supply-chain-day.com).

Challenge 3: Ensure appropriate human (specialized, updated and trained staff) and material resources (facilities, infrastructures and technologies) for FRAMELOG implementation

Guidelines:

A. Appropriate selection and training of staff in relation to FRAMELOG implementation

It is important that the quality of teachers is in line with the labour market and research demands and with the level of students that need to be improved permanently. Therefore, investment in guaranteeing appropriate professional competences of the HEIs' staff is necessary.

Quality of education through successful implementation of the FRAMELOG depends on highly qualified Professors. Therefore, highest possible care should be applied on the selection and training of Professors and other HEIs staff.

Practical guidance:

- Define selection criteria and objectives based on the educational programmes designed in collaboration with companies and research institutions from the logistics and supply management area
- For the selection of staff set-up specific quality standards (e.g. study title, qualifications, experience, etc.) that refer to their qualification and/or to the professional experience
- Support professional training of the staff, in collaboration with the key players and based on the permanent update of the educational programmes and on the innovations occurred
- Encourage teaching staff to join their national Logistics Association and participate in the activities of the association to ensure their continuing professional development (CPD) is current and relevant

Examples:

Encourage teaching staff to seek individual accreditation through the European Associations in the field

Use resource planning software to optimise the cost effectiveness of operations.

B. Active involvement of business, research actors and public institutions for the provision of appropriate resources for the organizations involved in the Educational Process, particularly HEIs

In order for HEIs to provide quality educational programmes it is necessary to ensure appropriate resources, in terms of experts, logistics, updated contents of the educational programmes, innovative teaching methods, financial support, etc. These can be obtained through various actions and with the support of several stakeholders, according to their professional profile and role. In particular, these resources can be obtained through projects financed at local, national, European and international level; through direct support from the business and research sector; through private funding from private and public institutions, etc.

It is necessary to underline that these resources are not only financial resources, but can also be translated into logistics, equipment, professional expertise.

Practical guidance:

- When planning educational programmes (within FRAMELOG), indicate also the resources needed and how HEIs are expected to obtain them also with the support of external stakeholders
- Train HEIs staff (through customized training programmes, conferences, seminars, meetings with policy makers and financing bodies, etc.) to design and manage projects in the field of higher education, financed by private and public institutions/organizations
- Involve companies, research and public institutions in educational programmes, in order to motivate and to give them the opportunity to have an active role in supporting education in the logistics and supply chain management area

Example:

Promote the support received in order to obtain public visibility and recognition for the quality of the educational programmes, achieved through active collaboration with key players.

C. Set-up cooperative learning environment within FRAMELOG for supporting innovation in the logistics and supply chain management area

The way learning takes place nowadays is very different in respect to 10-15 years ago not just in terms of contents (that are changing continuously), but mainly in terms of methodology.

We are now facing the 'learning output' approach that focuses more on the learning achieved and less on the transmission of knowledge from teacher to the student.

Logistic and supply chain management area is a dynamic context with relevant changes in terms of content and concrete tasks to be implemented. Therefore, educational programmes must be customized in order to provide the appropriate knowledge, skills and competences as requested by the labour market and in line with the trends in the research activity.

Effective learning takes place in cooperative environments where teachers act more as mentors/facilitators and students learn together from each other. The efficacy of this kind of learning is ensured mainly because the labour market is very interested not only in specific technical skills, but also in skills such as: team work, communication, leadership, learning to learn, active listening, giving and receiving feedback, critical thinking, etc. The last ones are fundamental skills that can guarantee continuous professional development of the future employee and imminent growth for the company.

Practical guidance:

- In order to create a cooperative learning environment, it is important to refer to FRAMELOG in each phase of the educational programme (planning, delivery, assessment and evaluation, improvement)
- Teachers must be trained to facilitate cooperative learning, involving also researchers, professionals from companies that can contribute with their specific expertise

- Technical instruments should be available in order to facilitate cooperative learning (e.g. equipment, platforms, software, etc). These can be provided not only by HEIs, but also by the research institutions and companies active in the logistic and supply chain management area, based on collaboration agreements.

Challenge 4: Align the contents, programmes, lecturers, educational methods with business requirements and innovative results from research

Guidelines:

A. Integrate the inputs received from the business and research sectors for defining joint education and training activities

FRAMELO's main aim is to enhance the cooperation among HEIs, research institutions and companies in the logistic and supply chain management area. In the previous guidelines we indicated various ways of collaboration for improving the quality of educational programmes through the implementation of FRAMELOG.

It is very important that all the feedback, suggestions, recommendations received from the key players in the occasion of the different collaborative actions, are deeply analysed and integrated in the HEIs activity in order to guarantee quality and relevance of the educational programmes.

Practical guidance:

- HEIs should be prepared to collect the input received from the stakeholders, research institutions and companies in particular, through specific analysis instruments (e.g. questionnaires, interviews, face to face discussions, round tables, etc.)
- The input received must be analysed carefully in order to extract the most relevant adjustments needed for enhancing the quality of the educational programmes
- Before making the specific integrations to the contents, programmes, lecturers, educational methods, check with the key players and make sure they are the most appropriate
- Continuously improve educational programmes by integrating the input received from stakeholders with the ultimate objective

to provide high quality educational programmes and to enhance students' employability competences.

Example:

- Connect and build links with key logistics organisations' research facilities such as DHL and Proctor and Gamble research facilities (www.dhl.com/en/about_us/innovation/dhl_innovation_center.html) (www.pgscience.com/home/rd.html).

B. Periodically check the validity of the curriculums based on the labour market/research trends

The sustainable implementation of FRAMELOG should allow for permanent cooperation among HEIs, businesses and research institutions. The results of this cooperation should be evidenced in the educational curriculum that is expected to be always up to date and in line with the labour market needs.

However, adjustments in the curriculum should not be made without a specific planning in order not to create misunderstanding for students and HEIs staff in particular.

Practical guidance:

- The implementation of the different cooperation activities, as indicated in FRAMELOG, should be planned on periodical basis (e.g. annual) and specific objectives should be defined in relation to these activities
- Eventual revision in the curriculum must be discussed with key players and communicated to stakeholders (internal staff, students, wider public, businesses, research organizations, public institutions, etc.)
- The results of the discussions occurring during the cooperation activities (e.g. bilateral meetings, roundtables, public events, working groups, focus groups) should be collected in shared reports and then implemented in the educational curriculum
- The adjustments to the curriculum should be done periodically – the exact period can be established when the curriculum is be-

ing designed (could be every year, or more, also considering the dynamics on the labour market and in the research field)

- Stakeholders should be informed about the innovations that have been made in the curriculum in order to keep them up-to-date and to demonstrate the relevance of the educational programmes.

Example:

Connect with applied research networks such as the Logistics Research Network in the UK and Nofoma in Scandinavia for their annual events and publications informing of latest applied research collaborations between logistics practitioners and logistics professionals (<https://ciltuk.org.uk/About-Us/Professional-Sectors-Forums/Forums/Logistics-Research-Network>) (<http://www.nofoma.net/>).

Challenge 5: Learning is student-centred and managed in collaboration with key players

Guidelines:

A. Engage students in the training needs analysis with regards to logistics and supply chain management area

The quality of education benefits students who are expected to build relevant competences for professional development. Key players (HEIs, companies in the logistic and supply management area, research institutions) are responsible for guaranteeing this quality and at the same time, they are also beneficiaries as well. The implementation of FRAMELOG represents a concrete instrument that facilitates the cooperation among these players for enhancing the quality and relevance of the educational programmes.

However, the efficacy of the educational programmes depends very much of the learner's participation and motivation. Considering the EQAVET indicators, quality education means that it is available to all learners irrespective of their individual specific needs.

Practical guidance:

- Based on the feedback received from students, HEIs should be ready to provide more individualized education programmes (through teacher training, equipment, logistics, etc.). Through cooperative learning, students will have the possibility to express their opinions regarding the educational programme (contents, delivery, assessment, etc.) and the fact that their input is being considered will represent a very strong motivational instrument for enhancing the quality of learning
- Engage students in all phases of education in order to make them feel ‘co-owner’ of their educational process (in the ‘Plan’ phase they can provide input regarding the educational materials, the delivery methods and approaches; in the ‘Do’ phase they can provide feedback regarding the impact and efficiency of the specific delivery approaches and can provide suggestions for adjustments; in the ‘Check’ phase they can provide feedback regarding the relevance and efficacy of the assessment methods and tools; in the ‘Act’ phase they can indicate which can be the most relevant revisions needed)
- HEIs should be ready to collect this input and analyse it, also in relation to the feedback received from other stakeholders, in order to further improve the quality of the educational programmes within the FRAMELOG
- Promote the input collected from students and the revisions made based on this in order to motivate students to be active in their learning process.

Example:

Learn from the network of European Students of Industrial Engineering and Management which exists to foster relations between students and is supported by industrial sponsors (<https://www.estiem.org/default.aspx>).

B. Active involvement of the business and research sectors in the analysis of learning needs

The implementation of FRAMELOG represents a concrete instrument that facilitates cooperation among the key players in the logistic

and supply chain management area. This collaboration should be present in all phases of education and at all organizational levels.

Practical guidance:

- Organize/ participate in activities that allow HEIs to better understand and define the labour market needs in terms of knowledge, skills and competences (e.g. round tables, scientific papers, conferences, etc.)
- Select the most relevant players to provide input for defining the learning needs to be addressed through the educational programme (in particular businesses and research institutions). The players must be chosen based on their impact in the research and industry context. They could be: companies, research institutions, agencies that conduct studies regarding the trends in the logistics and supply chain managements areas, high level experts in the area, etc. they could be involved either through public events or through bilateral/group-work meetings and discussions
- Based on the input received, define a list of learning needs and ask for final clarifications (from key players), if necessary.

Example:

Include the defined learning needs in the educational curriculum and periodically update them Erasmus University Rotterdam participation in SmartPort is an example of collaborative approach to student centred learning. SmartPort@Erasmus is a centre of excellence offering port related education and research and connects students, academics and practitioners to focus on future challenges, the dissemination and application of port related knowledge (<https://www.erim.eur.nl/smartporterasmus/>).

The University of Arkansas Innovation Center is the catalyst for the formation of a collaborative community of companies and faculty, linked interdependently in research and development focused on core competencies including supply chain, distribution, logistics and multi-modal transportation and where students work on company sponsored projects (<https://artp.uark.edu/innovation-center/>).

Challenge 6: Apply a competence-based approach to teaching/training

Guidelines:

A. Define competence-based education and training activities

It was underlined before that we are now facing a 'learning output' approach that focuses on the results of learning rather than on the time and information provided. This approach means that learning is expected to be assessed not only through the knowledge acquired, but mainly through the skills and competences built. Therefore, the learning activities must also be designed and implemented in order to build and assess specific competences related to the knowledge acquired.

Practical guidance:

- When defining the learning outcomes, refer to European/national/regional frameworks regarding academic education and professional qualifications. Normally these frameworks provide concrete definitions and requirements regarding what knowledge, skills and competences represent
- Define and assess the learning outcomes in terms of knowledge, skills and competences. It is highly important that the assessment is being made in relation to all the learning outcomes defined
- Design educational activities that enable students to practically develop skills and competences (e.g. through experiments, laboratories, internships, simulations, role play, etc.)

Example:

Use the European Logistics Association (ELA) Logistics Standards of Competence as a basis for the development of curricula. These standards of competence have been developed by logistics and supply chain professionals for the logistics profession and are updated on a regular basis to ensure currency (<http://www.elalog.eu/elaqf-qualification-standards>).

B. Set-up work-based assessment procedures and tools

One of the FRAMELOG implementation objectives is to improve the quality of the educational programmes in the logistic and supply

chain management area for enhancing the employability opportunities for students. In order to reach this objective, it is necessary to ensure that the different educational phases are in line with the labour market requirements. In particular, since the learning outcomes are defined also in terms of skills and competences, it is important to accordingly assess them. This approach will guarantee quality and relevance of the educational programme for the labour market in particular.

Practical guidance:

- In relation with the learning outcomes defined, design appropriate assessment methods and tools that involve in particular the labour market actively. We consider as appropriate those tools that allow for accurate evaluation of the specific learning outcomes (K, S, C), involves the key players relevant for the specific topic (also depending on the delivery process) and provides precise evidence for future recognition
- Train teachers, HEIs staff and company personnel to manage the organization of this type of assessment and the evaluation results
- Periodically update the assessment methods and tools, also in relation with the updates in the educational curriculum and based on the companies' input.

Challenge 7: Obtain accreditation for the course

Guideline:

A. Check compliance and conformity of the courses according to regional/national/European standards

Based on Cedefop's definition¹, **accreditation of an education or training programme** represents a process of quality assurance through which a programme of education or training is officially recognised and approved by the relevant legislative or professional authorities following assessment against predetermined standards.

1. Terminology of European education and training policy, Cedefop, 2014.

Especially when it comes to higher education there are specific quality standards defined at regional/national and European level and they are mandatory and rather different across Europe.

Within FRAMELOG it is necessary to underline the need to connect the academic sector with business and research therefore, besides official accreditation, it is necessary to highlight the need to address also competence standards defined by other bodies, such as professional associations, companies, etc.

Practical guidance:

- When planning an educational programme, search for the most relevant accreditation and recognition opportunities, in order to provide high level education and real job opportunities for students
- Involve experts from the professional organizations in the curriculum design team by inviting them in working groups, consultation meetings, discussion about learning strategy and objectives
- Stay informed about new opportunities for recognition of training curriculum by the labour market

Example:

Further to developing the ELA Qualification Framework, ELA has recently developed and deployed an accreditation process for HEI curricula in logistics and Supply Chain Management. The accreditation process is based on mapping the contents in the University curricula against the Standards of the ELAQF and “grading” the contents in terms of relative coverage of the ELA Standards.

Certified in Production and Inventory Management (CPIM), Certified in Supply Chain Professional (CSCP) and the Certified in Logistics, Transport and Distribution (CLTD) of The American Production and Inventory Control Society (APICS)

Mastery Model and Certified Professional in Supply Management (CPSM) of the Institute for Supply Management (ISM)

The Chartered Institute of Logistics and Transport -CILT - is a professional body for logistics professionals. A key activity of the institute is

to accredit university degrees as meeting the requirements for the highest level of membership of the institute which is Chartered Membership.

3.2. Guidelines for the challenges identified in the DO phase

Challenge 8: Ensure continuous and aligned with business professional update/development for teachers and trainers

Guidelines:

A. Support and facilitate continuous training of staff in line with the market and research trends, in the logistic and supply chain management area in particular

Staff training is considered to be a key element to ensure the quality of education programmes. For this reason, it is important to monitor and support it constantly in all phases of education, not only in the planning stage. The logistic and supply chain management area registers dynamic changes and therefore it is highly relevant to be ready for continuous professional update of the staff involved in the educational processes.

Practical guidance:

- Train the HEIs' staff in order for them to have the capacity to collect updated information about the innovations that take place in the labour market and research exploiting the cooperation activities that engage directly these environments
- Set-up joint monitoring systems (e.g. studies, industry analysis/statistics, etc.), in collaboration with business and research actors, that allow the identification of future changes and trends in order to be able to anticipate the competences needed
- Provide support, for professional update of the staff on the innovations that occur in the industry during the delivery of the education programmes
- Motivate staff to collaborate with business (consulting, mobility, joint research, etc.) also through providing attractive incentives.

B. Involve business and research in the updating and training activities for teachers and trainers

Despite eventual financial support that HEIs might need in order to enhance the professional training of their staff, the direct engagement of business and research brings much more benefits: up to date and field work information, practical approach, business/research contextualized training, enhancing sustainable cooperation between these three players (HEIs, business, research).

In order to ensure quality of education within FRAMELOG it is highly relevant the participation of the business and research sectors in the professional update of HEIs staff, in all phases of education, based on the innovations trends registered in the industry (such as: IoT, Industry 4.0, Artificial Intelligence, Cyber Physical Systems, Intelligent Transportation Systems, etc.).

Practical guidance:

- Considering the cooperation agreements, facilitate the involvement of business and research organizations in the permanent training of the staff, in particular in relations to industry innovations and trends from the technical and organization perspective
- During the delivery activities of the educational programmes, through cooperative approaches create occasions for professional update for the staff (e.g. meetings with experts from the logistic and supply chain management area, availability of up to date research results, etc.)

Example:

Encourage teachers and trainers to join their relevant national logistics professional associations with a focus on continuing professional development to ensure currency and relevance of logistics knowledge (<http://www.elalog.eu/members>).

Challenge 9: Learning takes place mostly through experimental and innovative practices/experiences in line with market needs and technical innovations

Guidelines:**A. Include appropriate practical learning activities and work-field applications in the training delivery's methods and tools**

The logistic and supply management area requires very practical skills and competences and therefore it is crucial to deliver educational programmes mainly through practical exercises and experiments. This approach not only will provide higher motivation to students and will facilitate learning, but will also allow students to build solid technical competences required by the industry.

Practical guidance:

- Prepare HEI staff to be able to implement the most innovative teaching methods that are mostly based on approaches such as: cooperative learning, flipped classroom, experimental learning, etc.
- Even when education is already taking place based on the initial planning, search for new pedagogies and teaching methods that may appear in order to improve the learning process
- With the support from the business and research organizations, make sure that all the theory is being explained through practical and experimental learning and work-field applications.

Examples:

The Logistics Lab Montanuniversitaet Leoben University in Austria serves as an interdisciplinary center for research and development. Companies supported the establishment of a logistics lab at Montanuniversitaet Leoben university by providing technology and software (<https://www.unileoben.ac.at/en>).

'Business on the Move' is an educational board game designed to excite and inspire players of all ages about business and global supply chains giving young people an opportunity to gain a real insight into the exciting world of logistics and supply chains through learning activities have now been developed in partnership with the logistics organisations who have sponsored the game (<https://www.businessonthemove.org>).

The Logistics Institute at the University of Hull built a virtual game to create logistics awareness in young people using the XBOX Kinect platform in order to generate higher levels of logistics awareness among school age children (www.hull.ac.uk).

B. Involve business and research in order to facilitate direct contact between students and technical innovations present in the labour market and research fields

FRAMELOG means cooperation, exchange of experience and joint activities implemented with several concrete objectives. One of these objectives is to enhance the employability competences of HEI students and prepare them for the industry requirements. In order to achieve this the cooperation at institutional level of the three key players is a mandatory precondition. However, learning cannot be 100% standardised and students should always be put at the centre of the learning in process in order to achieved maximum efficiency of education. Therefore, it is highly relevant to involve students and put them in direct contact with the industry and with the research organizations.

Practical guidance:

- Based on the cooperation agreements, during the delivery of the educational programme, facilitate direct contact between students and the specific technologies used by the business and research organizations (e.g. through stages, internships, demonstrators, etc.)
- Give students the opportunity to practically use the existing technology with the possibility both to develop related skills and competences and to contribute to research activities.

Examples:

The Technical University Wildau and the Brandenburg Technical University Cottbus - Senftenberg are working together to develop an Innovation Hub for new developments in knowledge and technology and which will act as an intermediary for business and civil society (<https://www.th-wildau.de>)

The Logistics Institute at the University of Hull is working in conjunction with the World Economic Forum Global Agenda Council on the Future of Logistic and Supply Chains to produce an innovative report on the impact of the Internet of Things (IoT) in the logistics and supply chain industry (www.hull.ac.uk).

Challenge 10: HEI's overall organization include appropriate opportunities for cooperation among HEIs, business and research

Guidelines:

A. Implement the stakeholders' engagement and communication strategies

On the basis of the cooperation agreements, HEIs need to continuously stay active in implementing the concrete agreements and communication strategies. This is necessary both for fulfilling their obligations (foreseen in the cooperation agreements) and for enhancing their network of stakeholders by demonstrating reliability and professionalism.

Practical guidance:

- Monitor permanently the implementation of the specific actions indicated in the agreements established with the stakeholders and take the necessary measures to guarantee their complete accomplishment (e.g. keep continuous communication with the contact persons involved in the agreements, show the negative impact on the educational programme in case the cooperation agreements are not respected by all parties, etc.)
- Promote to wide public the network of collaborators from the business and research contexts in order to gain trust and recognition for their educational programmes at local, regional, national and international level
- Stay active in searching for new cooperation opportunities and enlarge the network continuously.
- Establish a dedicated university office for cooperation with external partners such as KTO (Knowledge transfer office) in order to facilitate the communication

- Standardize the procedures for selecting partners, communication with them, reaching agreements, etc.
- Create such a collaboration process that favors the linkages with business, e.g. improve the processes and make them less bureaucratic
- Agree expectations, manage and monitor collaborative stakeholder relationships.

Example:

The establishment of Science Park Jönköping at Jönköping University provides support for the start-up, development and growth of business ventures. The students can access the resources Jönköping University or start and develop a new enterprise free of charge (ju.se/en.html).

B. Appropriate implementation of joint education and training activities

During the previous project activities, it emerged that fact the one of the difficulties HEIs have is not only to set-up cooperation agreements with business and research organizations, but to keep them alive in a sustainable manner. In some cases, this is also due to the fact that the implementation phase is not always monitored and supported appropriately by all involved sides (HEIs, but also from the research institutions and business).

Practical guidance:

- Apply monitoring processes that allow the key players (HEIs, business and research organizations) to constantly be informed about the actual implementation of the joint education and training activities during the delivery phase (e.g. online tool that allow the key players to be informed about the delivery activities and their impact, about the assessment results, students' satisfaction and interest in the specific educational activity, etc.)
- While delivering education through cooperation activities implement corrective measures in necessary, in order to guarantee the quality of the learning process within the FRAMELOG. For example, if during the delivery of the education programme the key players notice that the results of the formative evaluations show

a low level of learning achieved by students, they should discuss and analyse further these assessment results for understanding the reason and take the improvement actions. Moreover, if during the delivery phase, relevant technical innovation is taking place in the industry, it is necessary to adjust the educational programme (in terms of contents and delivery methods) so that students can learn about the most recent innovations available.

Examples:

'Logistics Start-up Days' are a regular feature bringing together Kuhn University students, professors and start-ups from the area of transportation and logistics (<https://www.the-klu.org/>).

The 'Global Student Challenge' aims to bridge the gap between the academic and corporate sector and to address the need for knowledge and product development in the area of supply chain finance. A second challenge is the 'Cool Challenge' is a web-based business simulation providing insight into the complexities and interdependence of supply chains operating under uncertain and volatile market conditions (<http://tfcstudentchallenge.org/>).

3.3. Guidelines for the challenges identified in the CHECK phase

Challenge 11: Develop longitudinal graduate tracking system: conducting effective joint data collection and analysis (e.g. market needs, unemployment rates, completion and placement rates)

Guidelines:**A. Evaluate the learning method and tools' effectiveness against the labour and research needs**

HEIs should engage business and research organizations within the FRAMELOG for gathering and analysing relevant data in order to be able to assess the level of quality of the educational programmes. This data should refer in particular to: completion of the education programmes, impact of the method and tools implemented on the learning process and results, placement rates, student readiness for further learning, level of employability skills, etc.

Practical guidance:

- Based on specific performance indicators set-up in the planning phase, assess the quality of the methodological approach and tools used within the educational programme
- Involve business and research organizations, as well as students and other stakeholders that participated at the educational programme in the assessment
- Collect and analyse the input received and make the necessary revisions in order to ensure the quality and relevance of the education programme and to strengthen the FRAMELOG implementation.

Examples:

Use demand forecasting techniques for planning and decision making; use historical data to identify patterns which are likely to continue and use mathematical models to predict future demand

Use advanced analytics to turn information into action to identify optimal courses of action.

B. Assess training effectiveness (use of acquired competencies in work-field context – through survey/interviews with companies and research organizations)

The employability opportunities and the economic growth of the logistic and supply chain management area depend both on the capacity of students to put into practice the skills and competences build within the education programme. Therefore, the assessment phase should refer not only to knowledge, skills and competences acquired, but mainly on the capacity of the student to use them in a work-field environment (e.g. in case of internships, stages, work-based learning programmes, etc.).

The implementation of FRAMELOG facilitates sustainable cooperation among the key players (HEI, companies and research institutions) and therefore, allows HEIs to measure periodically the effective application of the learning outcomes in a work-field context.

Through the various cooperation activities indicated in Framework it is necessary to collect also information about which competences students can really use in the work-field activities and with which results.

Practical guidance:

- Apply assessment instruments that can provide relevant data regarding not only the competences built, but in particular the students' ability to use them in work-field environments
- When organizing cooperation activities, in particular face to face meetings, interviews, roundtables, focus groups, ask questions regarding: e.g. which competences students actually use in accomplishing their tasks in the work-field context, with which results they use these competences, which are the missing competences if any, etc
- In addition to these cooperation activities, it is necessary to conduct also structured surveys/interviews that will allow more relevant and comparable data on this issue.

Example:

UNWE (University of National and World Economy) work with a consortium of stakeholders including non-profit sectoral and professional organisations, manufacturing and commercial companies with well-developed logistics departments, logistics service providers, and suppliers of logistics equipment and software to develop a competency-based approach to curriculum design, taking into account the opinion of the students and the business (<https://www.unwe.bg/en>).

Challenge 12: Apply feedback loops mechanisms among the three sides of the 'Knowledge Triangle' (University, Research and Business)

Guideline:

A. Develop and continuous update of a 'feedback loop' mechanism within the FRAMELOG, involving key actors from the logistic and supply chain management area

In order to guarantee not only the sustainability of FRAMELOG, but also its improvement over time, the key players should stay in permanent connection based on specific agreements and established working mechanisms that allow for smooth flow of data and communication.

This permanent exchange of data and experiences, based on specific conventions (that make clear statements regarding cooperation objectives, methods, performance indicators, tools, etc.) and having precise goals is the fundamental condition for ensuring the quality of the educational programmes and the sustainability of the FRAMELOG application.

Practical guidance:

- Based on the cooperation agreements, conduct permanent communication of data among the three key players in order to ensure that the educational programmes are always up to date for the industry and for the research environments (e.g. use common online platforms, regular emails and/or meetings, formative assessments, etc.)
- Organize Peer-Review activities among the key players in order to collect qualitative feedback and data, and for enhancing the cooperation
- Implement appropriate data management activities (that provide scientifically relevant data analysis, that provide accurate and integrated data from the key stakeholders, that provide data relevant and customized for HEIs, research and business, etc.) that allow for effective data analysis benefitting all main players: HEI, business and research organizations, students, the logistic and supply management area in general at all levels.

Example:

The Politecnico di Milano School of Management ‘Observatory on Contract Logistics’ is part of the Observatories on Digital Innovation system by Politecnico di Milano School of Management with a group of 20 companies acting as partners of the Observatory. Workshops are organized to transfer outcomes of the Observatories to Business School students (<https://www.mip.polimi.it/en/>).

3.4. Guidelines for the challenges identified in the ACT phase

Challenge 13: Periodically improve/update academic programmes (contents, delivery methods and stakeholders involved) and activities based on evaluation results and new market needs.

Guidelines:**A. Annual review of learning programmes and activities within the FRAMELOG**

The education programme can be improved in all its stages: planning, delivery and assessment, and it should be based on the data and feedback collected from the key players involved (HEI staff, business and research organizations, students, policy makers, other stakeholders, etc.).

However, relevant changes should be made at least one time a year in order to avoid confusion on one hand and guarantee quality and up to date education, in line with the innovations and trends registered in the industry and research in the logistic and supply management area.

Practical guidance:

- After collecting and analysing all the qualitative and quantitative data during the different educational phases, from the relevant players organize a cooperative event (e.g. roundtable, focus groups, etc. - inviting business, research institutions, students' representatives) and decide upon the changes to be made to the educational programme
- Once the revisions have being done and agreed, promote them to the internal staff that will be involved in the implementation of the revised programme
- Provide training and support to the staff for guaranteeing accurate application of the programme.

Examples:

Undertake joint collaborative planning and forecasting with key stakeholders to improve information flow about demand for new market needs.

Create a maturity model to enable universities and other stakeholders to create a route map for improvement to best performance and determining strategy.

B. Ensure readiness for change within the institutions

All the previous guidelines provided demonstrated how to enhance the Quality Assurance within HEIs and the assessment strategies within

FRAMELOG. Continuous improvement needs critical review, analysis and, finally, the organization of change, which is, undoubtedly, both the most crucial and critical step.

In practice, it is often seen that the last step of the PDCA-cycle, which is about organizing review and change is not consequently implemented. Therefore, special emphasis has been laid to the question how to ensure that organizational change is going to happen: one approach is to improve the abilities and competences of teachers and staff, the other one is to increase acceptance of change amongst people.

The final question is: how can a culture of change be achieved in the organization, and improvement of quality of education become self-evident? Of course, it is important to make sure that teachers, trainers and other staff of the education provider (that can be HEI, as well as business and research organizations) know about and understand the logic of the PDCA-cycle and of FRAMELOG. This way of thinking and acting should be integrated into the everyday life of HEIs and used systematically in all its areas of operation.

Beyond embedding this attitude and behaviour in the institution, the development of a quality culture is mainly influenced by human factors, which are supported and encouraged by making use of appropriate soft skills, as explained in the following figure (MERI-cycle).

Practical guidance:

- Support the development of all the necessary skills of staff for ensuring Quality Assurance within FRAMELOG in relation to the educational programmes, with a special focus on the soft skills indicated in the MERI Cycle;
- Motivate staff and mobilize resources for continuous improvement in terms of staff training, organizational profile, education programme, cooperation and communication with stakeholders from the logistic and supply chain management area, etc.;
- Appreciate and esteem the engagement of staff and stakeholders involved in the educational programme (rewards, public appreciation, engagement in other actions, etc.);

- Reflect and discuss the assessments, evaluations and opinions of staff and stakeholders;
- Promote and inspire appropriate improvement (through: accurate monitoring, constructive feedback, peer support, team working approach, etc.).

4. Conclusions

As suggested by EQAVET, the Guidelines build on the principles of the PDCA-cycle (Plan, Do, Check, Act), considering the characteristics of FRAMELOG and the prerequisites and peculiarities for QA in HEI in the logistic and supply chain management area.

It is a key priority of these Guidelines to promote and support high quality in in HEIs' educational programmes. At the level of the Education institution this can be integrated through implementing the FRAMELOG for anticipating new professional trends in the labour market, adapting the content of existing programs accordingly, introducing innovation in curricula (in terms of method and contents) and promoting readiness for change.

In the process of teaching and learning itself quality can be achieved by promoting the capacities of teachers and other staff to recognize and to respond appropriately to the individual needs of the students, by strengthening individualised education, targeted support and personal advice, individual consulting and work-based learning, with the engagement of key players, such as companies and research institutions.

Quality-related activities directly linked with the teaching and learning process are oriented in particular to train and motivate teachers and in-company trainers, and providing esteem for their strong engagement. They play a vital role in the production of quality, in particular when it comes to the customisation of services and elaboration of individual learning plans for the students. Quite frequently, the dynamics for quality are pushed by the enthusiasm of teachers and their commitment to improve their performance. Quality development is inconceivable without the personal engagement of staff.

In addition, within the context of FRAMELOG, quality activities also include a various number of actions conducted in close collaboration

with key stakeholders, in particular with companies and research institutions: set-up sustainable cooperation agreements, collaborate for definition, delivery and assessment of educational programmes, cooperate for further improvement of staff professional capacity and of the educational programme itself in terms of contents and methodology.

For the FRAMELOG Partnership, the European QA Framework has proven its capacity to serve as a common language that gave the opportunity to understand the peculiar approaches that need to be considered for successful implementation of FRAMELOG.

VALIDATION REPORT REGARDING FRAMELOG AND THE MANUAL FOR ASSESSMENT AND QUALITY ASSURANCE

Cristina Nicolau, UTBv

Motto: "Europe must strengthen the three poles of its knowledge triangle: education, research and innovation. Universities are essential in all three" (Commission 2005, p. 152).



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1. Introduction

The Validation Report regarding FRAMELOG and the Manual for Assessment and Quality Assurance makes the connection between the first three outputs produced in the Erasmus+ KA2 Project “European framework for Knowledge Triangle in Logistics (FRAMELOG)” and presents the results of three national reports and consultation activities held in Europe in order to validate the contents of the European Framework and to re-fine it into a more heterogenous form ready-to-be-easily-used within Knowledge Triangle, irrespective who the KT initiator is.

2. Review of FRAMELOG activities and summary of intellectual outputs

2.1. Why a framework in Logistics?

In science, a framework consists of the main supporting, skeletal, openwork or structural frame parts of a building, vehicle or object. Pragmatically, the meaning has been widened with dictionaries that also define a framework as a basic conceptional structure (as of ideas, rules or beliefs) from which something is developed or on which decisions are based. In this respect, in Logistics and Supply Chain Management, a framework is firstly used so as to lay the bases of quality production or service delivery and customer satisfaction, due to the major impact of this field on daily activities of all organisations, either public or private. But under the effects of globalization and with cost reduction, diversification and focalization as the major current business strategies, cooperation among social and economic players has been more and more felt as a real need. Thus, the Knowledge Triangle started developing. The European one, which aims at bringing together partner countries’ educational institutions, businesses and research centres from the same field or with the same needs with the aim of increasing the contribution of higher education and public research institutions to innovation and economic growth. This European Knowledge Triangle works now for the tomorrow’s Europe, bringing individual benefits and strengths to the angles (represented

by the players) and European added value to its core (the European Union itself).

2.2. Project's intellectual outputs IO1, IO2 and IO3 on short

As previously presented, the framework in Logistics represents the main structure on which the Knowledge Triangle may be built. And it was, starting with the best practices of cooperation among education institutions, businesses and research centres (**Intellectual Output 1**). The Knowledge Triangle cooperation examples described are currently cooperating in a cyclic way: education wants to respond to the competitive labour market needs, businesses do set quality standards, skills compendium and waging levels, research continuously comes out with the newer and the better.

Moreover, a framework in Logistics shall be developed and implemented in time and on time: developing a framework in a field registering continuous growth like Logistics may not seem easy whatsoever, but it is high time to do it. Any separation or lack of cooperation in Europe may be disadvantageous when updrawing statistic comparisons to Northern America (the place where the truck driver who reinvented shipping, Malcom McLean, was born) and Asia (ranking the first as number of world's largest commercial shipping ports). For this reason, **Intellectual Output 2** was developed with the aim of underlining the importance of increasing quality of labour force with practice-based education (or applied science education) and research. "The FRAMELOG" – the framework of indicators, methods and tools for the Logistic sector competence formation – was then born from the similarities and dissimilarities among the different examples of knowledge triangle collaborations and consists of the criteria and indicators needed to evaluate the strengths and weaknesses of its implementation especially in HEIs. Hence, the framework shall be used mainly by educational institutions which, after self-assessment, shall implement methods and instruments to enhance their engagement within the Knowledge Triangle, in particular in the planning (management function) and communication phases (management process). In this respect, this project offers specific guidelines for implementing

FRAMELOG for those stakeholders interested in cooperating within the Knowledge Triangle in Logistics, hereinafter called the future KT developers.

In this respect, any framework proposed shall be validated as contents and quality assurance by all the three key players: HEIs, business and research. The 4th phase of the project consists of generating the most relevant assessment criteria to be used at European level so as to move forward in the research of unity in terms of skills, qualifications, academic curricula, quality assurance of education in Logistics. It is such validation process that has highlighted all similarities and dissimilarities between players (higher institutions, mainly, as major providers of education in the Knowledge Triangle) and countries and has guided the research team to adjust the entire FRAMELOG.

As written in its proposal, this project shall support qualitative and relevant academic offer of HEIs as well as improve transparent and mutual cooperation between HEIs, business and innovation organizations (research mainly) in developing and recognizing academic qualifications. Based on the development trends in the European Logistics (presented in Intellectual Output 1), HEIs have to be practically oriented when updrawing study materials, engage business in education, develop a competency-based approach to curriculum design, contract education as well as provide internships and dual programmes combining study and work experience. In this regard, the 13 case studies offered as good practice in this project underline, on one hand, how HEIs have developed their quality strategies with regard to academic offers of study programmes in Logistics – thus becoming drivers of educational models, but also that the business environment, whenever it had the need to further develop or perform changes in skills, qualifications and occupations as a result of market opportunities or threats, pushed the educational system ahead and co-worked so as to develop education.

As a conclusion, the KT developed by the referred examples focuses on HEIs' two-way cooperation with businesses and innovation centres in Logistics with regard to:

- Academic curriculum of every study programme (Bachelor, Master and PhD) in Logistics
- Academic syllabus of every Logistics subject taught within any study programme (Bachelor, Master and PhD)
- Resources used to deliver education (human, material and financial)
- Post-education service (quality assessment of skills and knowledge)
- Proper responses to industry needs.

Last, but not least, the Guidelines for addressing quality assurance and assessment challenges within the FRAMELOG (Intellectual output 3) present in detail how the KT players may respond to challenges met during implementation of the KT. When the KT in Logistics is created and implemented, its activity may be subjected to some risks, of which the common ones have been identified in the project. Hence, mitigation strategies were identified in the project under the form of specific guidelines.

2.3. FRAMELOG - The European Framework in Logistics

As herein before mentioned, HEIs pass through the FRAMELOG in Logistics, the European framework created and implemented, with the major aim of enhancing quality of education. Fig. 1 below proposes the design and clear description of the framework developed in the project.

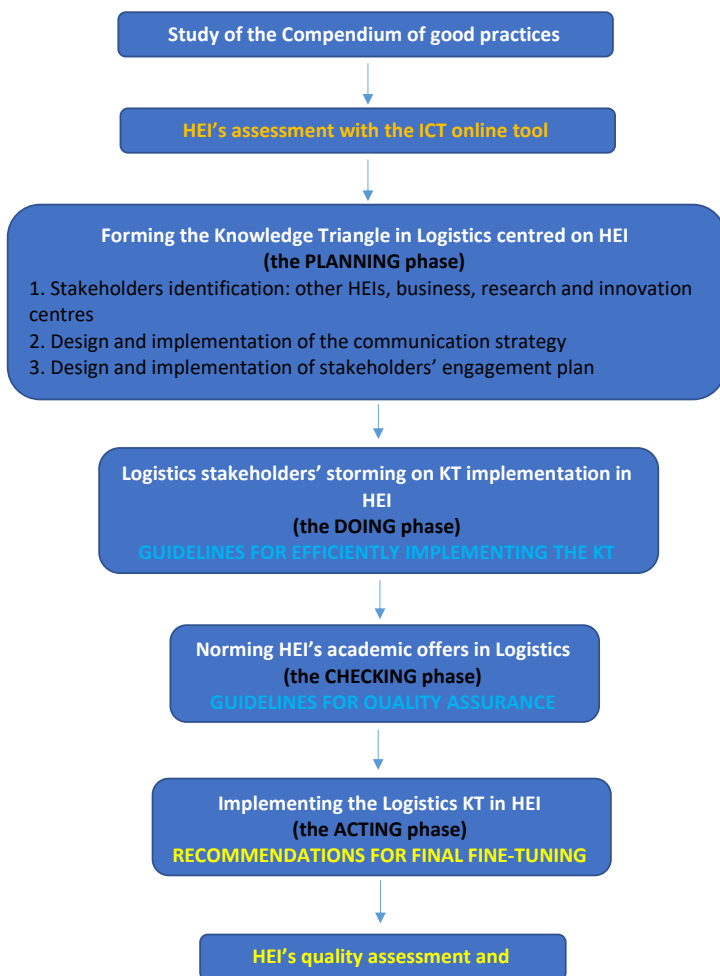


FIG. 1 - FRAMELOG, THE EUROPEAN FRAMEWORK IN LOGISTICS

3. Background for Intellectual Output 4 – Validation report regarding FRAMEOG and the Manual for assessment and quality assurance

This document presents the activities of the 4th intellectual output of FRAMELOG as a continuation of the activities previously undertaken. The testing activities referred to in IO4 are actually the consultation activities with different stakeholders of this project.

Therefore, as much as we are concerned, the presentation of project's stakeholders done in IO2 shall be used as the main taxonomy (O2A3), but there are some changes to be operated according to further research carried out during the development of the Outputs. In particular, we propose here the following additional analysis of the KT stakeholders, still developed according to the "power-interest" grid of Ackermann (Eden & Ackermann, 1998):

a) Key players:

- the **HEIs** which aim to improve quality of the education delivered with regard to Logistics or to implement courses in this field in their academic curricula (irrespective of their main purpose: education only or both education and research);
- **Companies** which aim at incoming employees who possess the needed soft and hard skills in Logistics or which want to provide on-the-job training sessions in Logistics to their own employees; as businesses are generally using the cost reduction strategy, their main interest would be to reduce costs of HR processes, training being a very expensive one
- **Professional associations in Logistics** who are interested in delivering vocational and adult training, competence assessment and accreditations of academic/vocational degrees
- **Students and Graduates** working or willing to work in Logistics on one hand, and **Workers** who consider having a degree or a qualification/in-depth course in Logistics on the other hand; they all have the possibility to express their opinion and make own suggestions regarding the curricula and the delivery of courses in Logistics as quality assessment tools are at their disposal in any HEIs.

- b) **Relevant players:** scientific associations, trade unions or national bodies with specific interest in Logistics
- c) **Crowd:** local, national and European communities who use Logistics in their everyday activities and who would benefit from the increase of Logistics service quality if FRAMELOG is implemented at European level by the cooperation of the stakeholders presented in point a) above mentioned
- d) **Other:** other European projects which take this project's outcomes as good practice, especially bodies in national accreditations, researchers in other fields of research.

Under such taxonomy and taking into account the purpose of this project (aimed at enhancing cooperation among HEIs, business and research and benefiting from each other's expertise), we underline that **HEIs** are the main actors in starting developing the Knowledge Triangle in Logistics, their scope is to provide academic qualifications and skill-assessment (irrespective of their type). According to the project experience and expertise considered in its development, the business sector may also have expressed its wish to start developing the Knowledge Triangle, but most of HEI's are empowered by national and European educational laws to design academic curricula and course descriptions and it is only the national accreditation bodies of every country which regulates the law to which HEI's operate, they are assessed and they are given the right to operate. In this respect, the Knowledge Triangle brings into the educational environment all the other stakeholders previously described who put their own efforts to receive their own benefits from FRAMELOG – this highlights the efficiency of this state-of-the-art project.

4. Research methodology

In order to test the validity of the proposed outputs, we designed a mixed methodology consisting firstly of a quantitative method of research which in general, is to be found in conducting scientific research and then, by a qualitative research (ELA workshop and focus group interview). The following main constraints were taken into account:

- using an online questionnaire (according to the quantitative method itself) would generate too objective data as well as con-

fusion (the project team has already used such a tool for IO2). In this circumstance, the respondents would have been asked to give answers which would have meant that they read and knew in detail the project's outputs in order to provide real and useful feedback to the research team. In any research, we cannot have such expectations, so it means the subjects shall be first presented the intellectual outputs on short and then be asked for feedback on them. Such data collection is appropriate to qualitative research.

- the ideal number of sample respondents in a focus-group interview is maximum 12, so it cannot be used during a workshop with minimum 20 participants. Thus, a qualitative method itself cannot be used.

Under such circumstances, the design of this validation report consists of:

1. Part 1: individual directive survey (questionnaires) with HEIs' business' and research institutions' representatives to be used within national workshops in Bulgaria, Italy and Romania
2. Part 2: directive focus-group interviews with different players within the European Logistics Association

4.1. Research aim and importance

Output title: Validation Report regarding FRAMELOG and the Manual for Assessment and Quality Assurance.

Importance: This report shall test the validity of the project outputs among the key stakeholders, in particular bringing a business perspective to "the FRAMELOG" and Knowledge Triangle application in Logistics, which mainly consists of indicators updrawn for HEIs.

Scope: implementing a 360° assessment approach to updraw the final version of the European Framework for Knowledge Triangle in Logistics (FRAMELOG). As presented in the project proposal, the European Report on testing and consultation activities implies that after collecting and analysing the national & ELA testing reports, partners will develop the European piloting report that will include the comparable analysis of the national feedback and will indicate commonalities and differences between the different countries/contexts.

4.2. Research objectives

The specific research objectives are presented in Table 2, and are clustered under three general objectives:

- 1. Designing the commonly shared testing methodology for assessing Framework and Guidelines
- 2. Analysing research results
- 3. Customizing the Framework on common needs

For each of the specific research objective, a paragraph of the presented Validation report is dedicated, showing the Consortium decision for their achievement.

General objectives	Specific objectives
GO1. Designing the commonly shared testing methodology for assessing Framework and Guidelines	SO1.1. Defining research population and instruments for testing the Framework
	SO1.2. Organizing piloting activities for testing the Framework
	SO1.3. Assessment of key project results
GO2. Analysing research results	SO2.1. Analysing feasibility in the European countries (starting with validation and comparison between BG, IT and RO)
	SO2.2. Identifying changes to the previous outputs in relation to the results obtained within testing activities
GO3. Customizing the Framework on common needs	SO3.1. The European Report on testing and consultation activities
	SO3.2. Final form of the Framework according to stakeholders' professional feedback

TABLE 1 - VALIDATION REPORT OBJECTIVES

4.3. Research population and sample, research instruments and data collection

Research population: Framelog stakeholders as defined in Stakeholders’ Engagement Plan (national and European key actors in the implementation of FRAMELOG). Countries’ populations, GDPs and LPIs presented below show if the comparison between the 3 countries is reliable and if their mean is representative for the whole European Union so as to extrapolate the framework created in the project at European level. Hence, we shall analyse representativeness according to 3 criteria:

- a) rate of the three countries’ population in total population of the European Union
- b) GDP per capita
- c) LPI scores

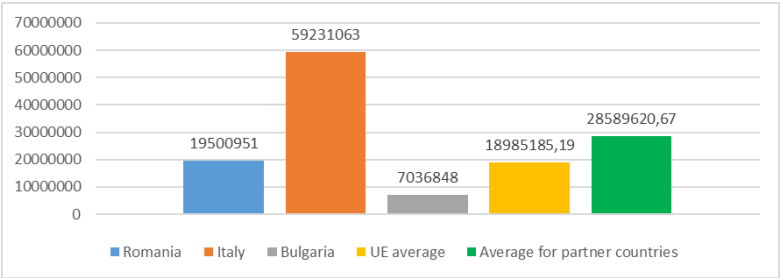


FIG. 2 - RESEARCH POPULATION CHARACTERIZATION ACCORDING TO POPULATION NUMBER

The diagram in Fig. 2 shows that there is a significant difference between the European Union’s average (EU-28) and the average of the population compared in our research (the three analysed countries). But, out of the 516.6 million people in the European Union in 2018, our researched population represents 16.6%, a representative percentage if we are to take into account that 21 EU countries have their population below the average for the whole European Union.

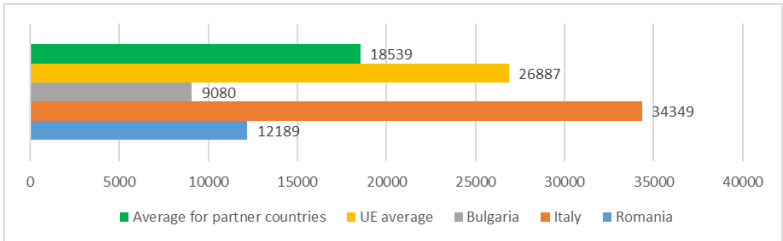


FIG. 3 - RESEARCH POPULATION CHARACTERIZATION ACCORDING TO GDP PER CAPITA

Fig. 3 above shows that the EU average for GDP per capita is higher than the mean for our researched population formed by three countries. When analysing this indicator according to the data offered by the [International Monetary Fund World Economic Outlook \(October-2018\)](#), we clear see that 14 out of the 28 EU countries have a GDP per capita higher than the EU average, Italy being part of this group whereas Bulgaria and Romania are not.

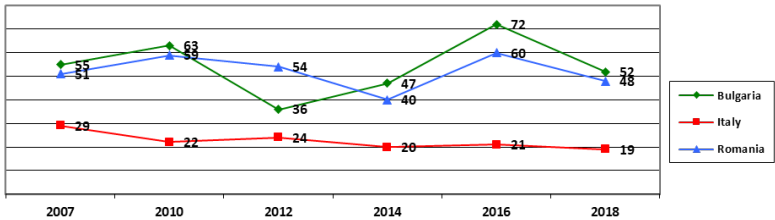


FIG. 4 - RESEARCH POPULATION CHARACTERIZATION ACCORDING TO LPI RANKING

Starting from the LPI definition (“The Logistics Performance Index is an interactive benchmarking tool designed to help identify challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance”), scores and ranking presented in Figs. 4 and 5, we may state that at European Union level, Logistics field is still to be developed for two of the countries herein compared, Bulgaria and Romania. Hence, Eastern European countries

for which this field is still a challenge are part of the 14 EU countries whose LPI scores are below the European Union average of 3.54. In these countries, the growing industrial area requires innovative solutions in the field of domestic logistics and massive investment in the field of transport logistics. These findings highlight the importance of developing a project such as Framelog and the scientific results generated by our research.

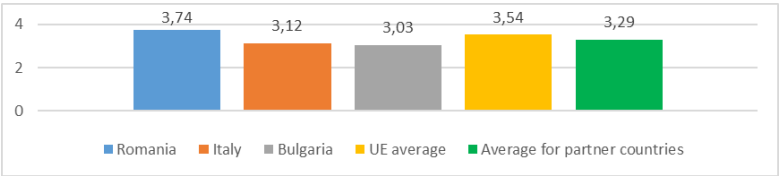


FIG. 5 - RESEARCH POPULATION CHARACTERIZATION ACCORDING TO LPI SCORES OF 2018

According to the LPI indicator, the diagrams in Fig. 5 show that the field is in development in Bulgaria and Romania. Furthermore, the values shown in Fig. 6 are still far from the peak value recorded by Germany who leads the ranking with 4.19. The situation can be improved only by significant investment in the field in order to reduce the gaps, but especially 7999for the compatibility of the logistics networks.

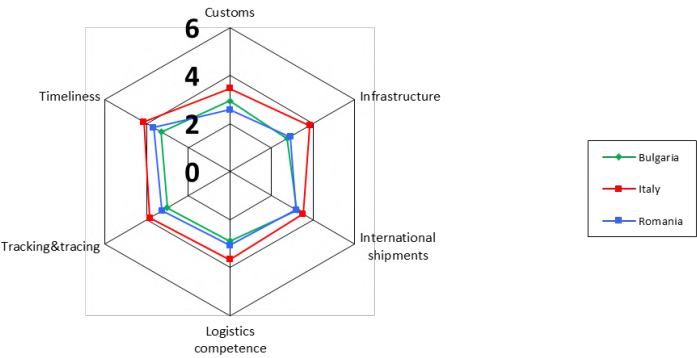


FIG. 6 - RESEARCH POPULATION CHARACTERIZATION ACCORDING TO LPI INDICATORS

The different stage of economic development of the three participating countries is well illustrated by the *Infrastructure* criterion in Chart 9. Traceability, an essential condition in the performance of a logistics system, is an area of interest. Performance can be sustained with simultaneous investment both in infrastructure and in human resource training. Relatively similar values show that there are similar concerns about logistics training. There is a need for an impetus for university studies because there is a clear lack of specialists in this field. The transformation required by the transition to Industry 4.0 involves evolved logistics networks and this goal can only be achieved through the existence of an educational system that makes it possible to obtain appropriate and up-to-date skills.

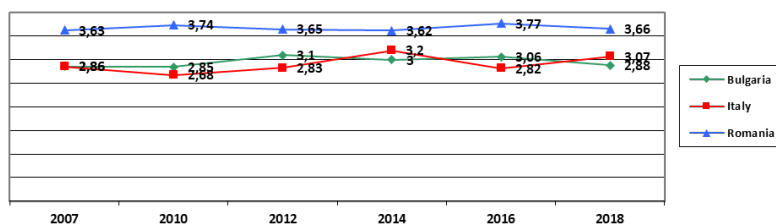


FIG. 7 - RESEARCH POPULATION CHARACTERIZATION ACCORDING TO LOGISTICS COMPETENCE

With the data shown in graphs above, we consider that the comparison is reliable and the framework in Logistics may be extrapolated for the whole Europe.

Research samples:

- Part 1:** experts in business, research and academic field (reached with the multiplier events) including some already selected for the development of the Compendium (O1), the Guidelines (O2A4) and quality assurance (Q3). Total number of respondents is 90, of which 30% were from Bulgaria, 31% of Romania and 39% from Italy. Out of the total number, HEIs were represented by 42%, business by 52% whereas research by 6%.

- **Part 2:** The sample used in the ELA workshop consisted of 18 people from 12 countries. The participants were all Logistics professionals of which 42.86% were from academia, 37.71 % represented the business community and 21.43 % were from research.

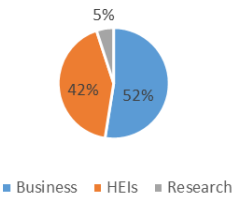


FIG. 8 - RESEARCH SAMPLE

Research instruments:

- **Part 1:** Paper-pencil questionnaire for individual use with the scope of testing the Framework and Guidelines.
- **Part 2:** The workshop and the Focus group used an interactive tool called ‘Mentimeter’ which recorded and analysed the responses of the participants in real time. The facilitator was therefore able to question participants further on any of the findings as the meetings progressed.

Data collection:

Part 1: during the 3 national workshops: Bulgaria, Italy and Romania (January-February 2019)

Part 2: during the national workshops (recommendations) and European workshop (March 2019)

5. Results of consultation activities: quantitative and qualitative analysis of FRAMELOG stakeholders

In the following sections, we will present the results obtained from the evaluation activities designed and implemented to test the FRAMELOG Intellectual Outputs. The presented results are grouped according to the mixed methodology performed, showing first the

quantitative analysis results, organized in the four sections of the Deming wheel cycle: A. Planning, B. Performing, C. Checking, D. Acting. Then, the qualitative analyses from the focus group results will be presented, organized according to the three Intellectual Outputs: IO1 – “The Compendium of Good practices”, IO2 – “FRAMELOG framework, Self-assessment tool and Guidelines” and IO3 – “Guidelines for Quality Assurance”.

5.1. Quantitative data analysis: conclusions on FRAMELOG at national level, comparing and contrasting partner countries

Hereafter, the results from the data collected with the quantitative methodology designed for evaluating the Output are presented following the Deming wheel cycle. First the Planning phase results are shown, followed by the Performing, Checking and Acting ones.

A. Planning

According to the results presented in Fig. 9, in the planning phase, ‘planning stakeholders’ engagement’ is the most important challenge in the 3 partner countries (4.21), followed by ‘ensuring appropriate human and material resources’ (4.19) and ‘implementing student-centred learning focused on students’ needs in terms of knowledge, skills and competences’ (4.17). It is obvious that ‘obtaining course accreditation by public institutions and/or private institutions’ is the lowest challenge in all the three countries analysed whereas the most important challenge at national level presents the following differences: in Italy, it is ‘ensuring appropriate human and material resources’; in Bulgaria, it is ‘aligning academic offer to business requirements and innovative research’; in Romania, there are the same trends with the European registered values, more precisely ‘implementing student-centred learning’ and ‘planning stakeholders’ engagement’.

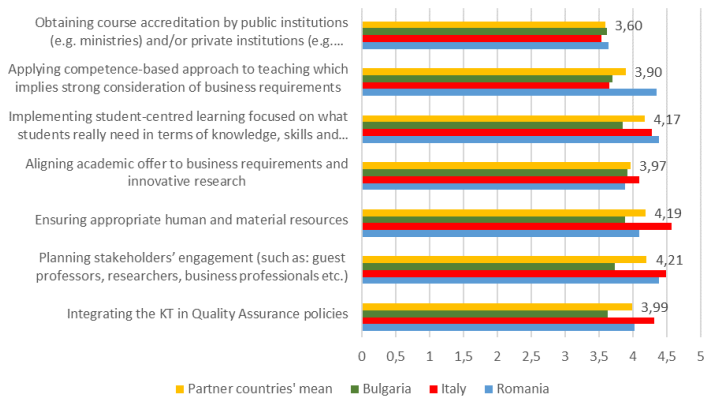


FIG. 9 - CHALLENGES IN PLANNING HIGH-QUALITY COOPERATION

When analysing the indicators to assess quality in the planning phase, the higher scores which show the most efficient indicators at the level of the three partner countries altogether were: ‘the availability of educated staff for specific activities’ with 4.21 (ranked the 1st in Romania), ‘selecting educational programmes with the collaboration of business and research’ with 4.08 (ranked the first in Bulgaria) and ‘choosing lecturers with the collaboration of business and research’ with 4.15 (ranked the first in Italy).

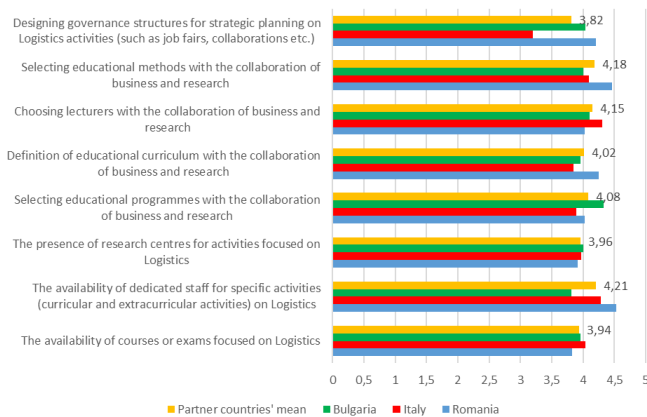


FIG. 10 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN PLANNING PHASE

In Fig. 11 below, we present our respondents' opinions on the guidelines helping in providing education of high quality in the planning of the Knowledge Triangle in Logistics. In this view, to the greatest extent there were identified: 'defining competence-based education' with 4.38, 'selecting educational disciplines, contents and methods in a collaborative framework between HEIs, business and research' with 4.34 and 'ensuring appropriate human and material resources for implementing FRAMELOG' with 4.31 (ranked the first in Bulgaria). Very interesting is the fact that in Romania, three indicators took the first three ranks whereas in Italy, 'developing a stakeholders' network' was scored the highest.

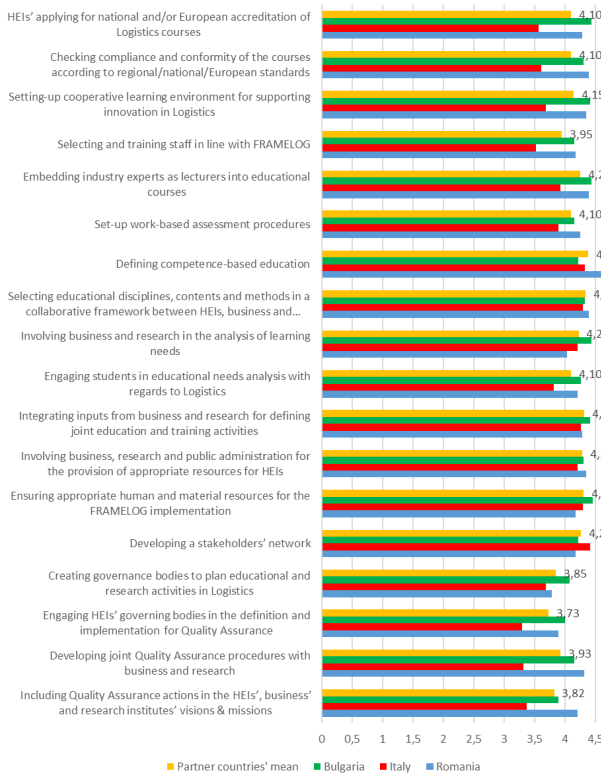


FIG. 11 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN PLANNING PHASE

B. Performance

The most important challenge in the doing phase is, at the level of the three partner countries herein analysed, ‘implementing innovative and experiential learning’ which scored 4.07 (which registered in Italy the first rank). In Bulgaria and Romania, ‘aligning professional development of teaching staff to business’ scored the most, showing that, as in the previous data analysis, there is still an issue regarding teaching personnel in Logistics.

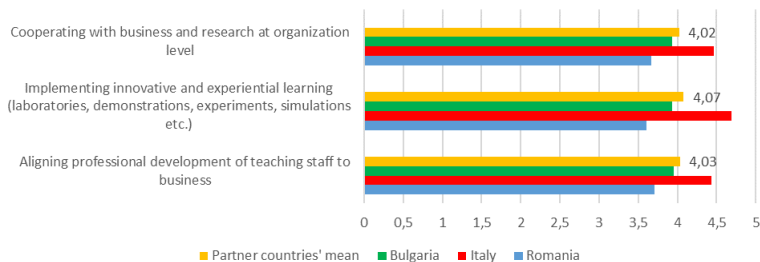


FIG. 12 - CHALLENGES IN PERFORMING HIGH-QUALITY COOPERATION

For the challenges herein before described, the project team identified the indicators presented in Fig. 12. For the sample analysed, ‘organising visits by business professionals in HEIs to deliver lectures related to Logistics’ ranked the most effective indicator with 4.34 and so did it rank the first in Romania and Italy. In Bulgaria, another indicator scored the most, ‘coordination with business and research in offering of internships on Logistics’, but it got also the first rank in Romania (both indicators received 4.1).



FIG. 13 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN PERFORMING PHASE

With regard to the most important guidelines in the performing phase, the sample provided quality information such as: ‘improving internships aligned with educational and business needs’ is the challenge ranking the first which means that respondents gave importance to internships as a product of the Knowledge Triangle in Logistics. This challenge was the most important also in Romania and Bulgaria (which had other two challenges with the same score of 4.41), whereas in Italy, the major concern was given to ‘disseminating results from the cooperation’.

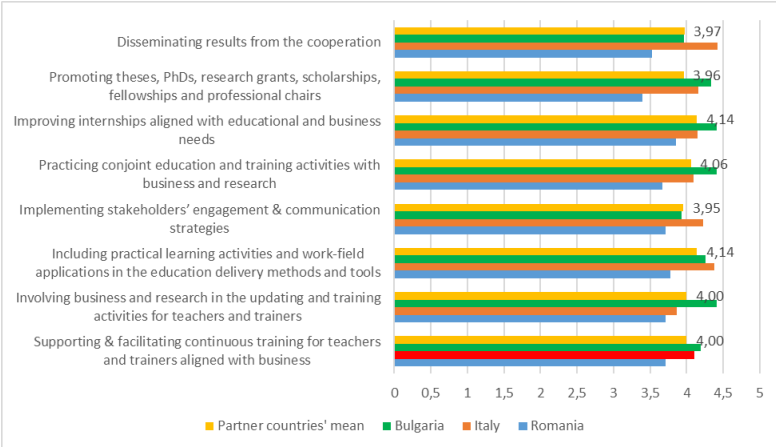


FIG. 14 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN PERFORMING PHASE

C. Checking

This phase presents only two challenges, which received above average importance from the respondents. Thus, Fig. 15 shows that in Italy, ‘applying feedback loops mechanisms among the three sides of the KT’ surpasses the partner countries’ mean, and so does the indicator ‘developing a longitudinal graduate tracking system’.

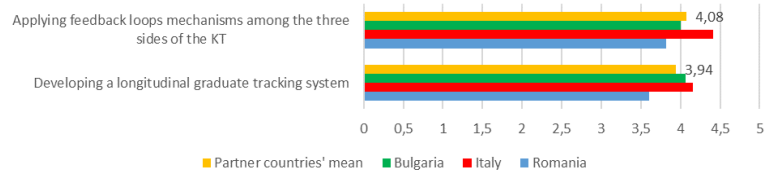


FIG. 15 - CHALLENGES IN CHECKING HIGH-QUALITY COOPERATION

Out of the three indicators needed in this phase to assess the quality of education in Logistics, two scored above 4 which show that respondents perceived them as effective: ‘production of intellectual outputs’ and

‘employment as a result of Logistics internships/partnerships’. With regard to ‘control of the alignment of the Logistics course with external partners at the end of the course’, we observed that respondents from all the three partner countries scored average, the mean being of 3.77 (Fig. 16).

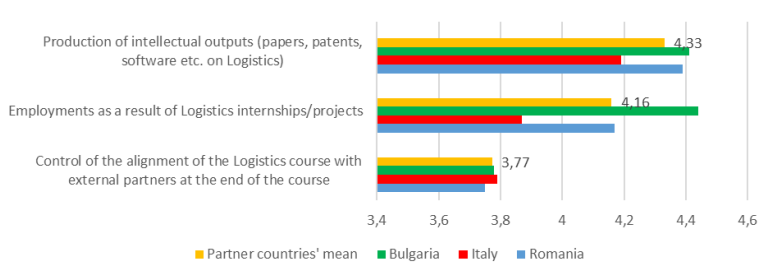


FIG. 16 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN CHECK PHASE

Thus, the four guidelines responding to the challenges herein before presented show that ‘developing and continuously updating ‘feedback loop’ mechanism between the key actors within the KT’ (4.26) was to a higher extent important in the three partner countries together with ‘engaging new potential stakeholders’ (4.21). Fig. 17 below shows an interesting fact, that in Italy, these two guidelines were not as important as in Bulgaria and Romania.

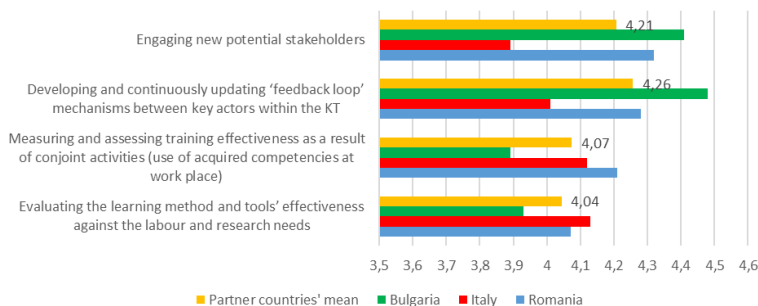


FIG. 17 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN CHECK PHASE

D. Acting

The challenge identified in the acting phase presents a particular condition: Italy registered a higher score than the mean for the three partner countries showing that academic offer is perceived as hardly periodical-ly improved/adapted according to the results assessed and the needs on the market.

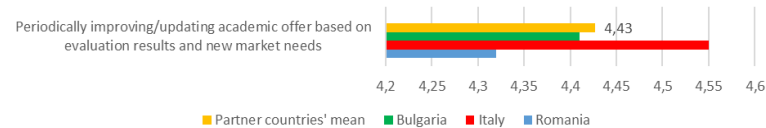


FIG. 18 - CHALLENGES IN ACTING HIGH-QUALITY COOPERATION

As regard the two guidelines useful in the acting phase, we highlight that the two Latin countries, Italy and Romania, registered higher scores for ‘ensuring readiness for change within the institutions’, whereas Bul-garia had ‘reviewing learning programmes and academic activities in line with the Framelog’.

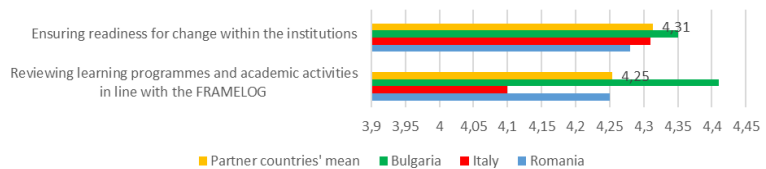


FIG. 19 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN ACTING PHASE

5.2. Qualitative analysis: conclusions at European level

According to results of the qualitative evaluation activity designed to test the FRAMELOG Intellectual Outputs, we present the most significant suggestions qualitatively collected within the two ELA events in which the focus group has taken place. The complete results are collect-ed in the ELA report, attached here as Annex. As already mentioned, the

results are arranged according to the three Outputs, IO1 – “The Compendium of Good practices”, IO2 – “FRAMELOG framework, Self-assessment tool and Guidelines” and IO3 – “Guidelines for Quality Assurance”.

On IO1 – “The Compendium of Good Practice”:

The Compendium of Good Practice was considered a very useful tool. The case studies provided in it offer a practical view on the link between the participants in the Knowledge Triangle in the area of Logistics. However, due to its lengthy approach, businesses found it rather difficult to use for practical purposes in a quick manner. One example concerning this query was to be able to cross-search through the Compendium by key words, wherever they appear in various case studies.

On IO2 – “FRAMELOG framework, Self-assessment tool and Guidelines for implementation”:

The qualitative analysis confirmed that cooperation within the Knowledge Triangle in Logistics is important, in particular KT was considered relevant for the business side (41.35%), followed by HEIs (31.70%) and research (26.94%).

This intellectual output would bring benefits for respondent’s organisations, with an internal ranking of 13.81% for ICT online tool and 20.33% for Guidelines for implementing the KT. It should be noticed that 27.27% of the participants felt that the ICT online tool needs to be further developed in order to be fully exploitable, whereas 18.18% indicated the same opinion for the FRAMELOG framework and Guidelines for implementing the Knowledge Triangle.

Generally, Guidelines for Implementation was seen as a very useful “how to collaborate” tool for the universities to use, while FRAMELOG self-Assessment Tool was not seen as completely useful in its current format but, as the widespread opinion about its usefulness in the long-term perspective was positive. The main suggestion received was to transform it into a benchmarking tool or a tool for self-assessment of an organisation’s compliance to the Quality Assurance document to enhance its practical value.

On IO3 – “Guidelines for Quality Assurance”:

Regarding this output, just 13.93% of respondents considered Quality Assurance Guidelines useful, less than the Self-Assessment Tool or the Compendium of Good Practice.

The main explanation for this result is related to the fact that the Guidelines for Quality Assurance were considered to be “surplus to requirements”, due to extensive QA guidelines already in place at universities at national level.

6. Recommendation for final fine tuning of the framework and guidelines

According to the research conducted in the project and herein before presented, IO4 resulted in the necessity to operate some changes on the intellectual outputs IO1, IO2 and IO3 so as to make FRAMELOG much more user-friendly and easy to use not only by HEIs, but also by businesses. Actually, the raw data is presented as follows so as to show the originality of the results under the form of proposals received from the stakeholders consulted.

A. Proposals for IO1 – “The Compendium of Good Practice”:

Regarding the Compendium of Good Practice, it was recommended to be disseminated in the future mostly in its web-based format. Considering the opinions of business representatives to make the Compendium easier to manage for a quick search, one suggestion would be to insert a web-based index comprising the most significant items used in the text, and to add a short description of each one, mentioning its practical purpose for companies. At the moment, a user-friendly version is already available on the official FRAMELOG website, in order to enhance the accessibility of the contents. Hereafter, two Images showing the actual layout of the Compendium.



Good Practices in the field of "Knowledge Triangle" in HEIs

Zaragoza Logistics Center (ZLC), SPAIN

The parties involved in the Knowledge Triangle are: ZLC; University of Zaragoza; state administration – Spanish Ministry of Education and Science; regional administration – Government of Aragon; Massachusetts Institute of Technology (MIT) supporting the development of educational activities at ZLC; Ibercaja and EU funding of the research/educational activities; private business sector represented by the companies from PLAZA S.A., students and alumni.

Good practices in the Knowledge Triangle include:

- Strong focus on *applying experimental approach to education* combining business case discussions, lectures, simulation games and exercises, engaging students to take part in international competitions, work on an applied project, expert talks and company visits.
- *Industry sessions* regularly provided to students where representatives from various companies are welcomed to present their company's operations to ZLC's students, interact with them and/or conduct interviews.
- Attracting business through flexible and beneficial agreements, based on the *developed formal incentive mechanism for industry participation in education and research*. ZLC has developed a corporate programme that offers companies three levels of collaboration

EXTRACT FROM THE FRAMELOG WEBSITE – ZARAGOZA'S GOOD PRACTICE EXAMPLE



Compendium of Good Practices

The FRAMELOG project aims at the development of the "knowledge triangle" by linking higher education institutions (HEIs), research organizations and business in the field of Logistics and Supply Chain Management (L&SCM). One of the outputs from the FRAMELOG project implementation is the Compendium of good practices in the field of "knowledge triangle" in HEIs. Its objective is to highlight examples of good practice in the "knowledge triangle" approach, including details regarding the methods applied and results achieved. The Compendium is also considered as a basis for the dissemination of the "knowledge triangle" culture in the academic sector for programmes in the field of Logistics and Supply Chain Management.

The development of the Compendium encompassed the following activities: defining criteria for collecting and selecting good practices; a good practice development framework and a template for the good practices description; analysis and selection of existing examples of good practices; description and thorough analysis of the selected most relevant cases.

Good Practices in the field of "Knowledge Triangle" in HEIs

Zaragoza Logistics Center (ZLC), SPAIN

Rotterdam School of Management, Erasmus University, The NETHERLANDS

The University of Huddersfield, UK

EXTRACT FROM THE FRAMELOG WEBSITE – OVERALL COMPENDIUM OF GOOD PRACTICES, WITH BUTTONS FOR EACH GOOD PRACTICE EXAMPLE

B. Proposals for IO2 – “FRAMELOG framework, Self-assessment tool and Guidelines for implementation”

The FRAMELOG Self-assessment tool would be useful if it was developed into a benchmarking tool or developed as a web-based self-assessment tool for compliance to the two guideline documents. In this respect, its continuous updating and maintenance on the web is required, so as to provide a modern platform with enhanced inputs from what is happening in the ever-evolving business environment around Logistics Stakeholders’ consultation unveiled that the self-assessment tool should be re-structured in a more user-friendly layout in order to be more supportive for its purpose.

In addition to this, in terms of sustainability, they observed that also the purpose of the tool could be renovated in a benchmarking tools against given standards in line with the available tools. In this way, they propose, it would be useful to compare their performance with others. Taking into consideration this feedback, based on the capacity of the used software (*Limesurvey*) the Consortium worked on re-designing the self-assessment tool’s structure. These improvements are mainly related to the:

- simplification of the applied language, in order to facilitate the comprehension of the question to a wider audience;
- the reduction of the length of the questionnaire, reducing the non-compulsory sections to be filled in.

Here below one example, supported also with information provided by the Image below, of a section in which it could be possible to add a drop down menu instead of the manual insertion (e.g. ‘Dimension of the company’, ‘Business sector’).

Please fill the table with the data required

	Company name
Dimension of the Company (Small/medium enterprise: fewer than 250 persons employed; large enterprise: 250 or more persons employed)	
Turnover (last year)	
Business sector (See "Note" on the bottom of the page)	
job position of the filler	
Country(ies) of activity	

* Business sector: please choose between the following cluster:

EXTRACT FROM THE ONLINE SELF-ASSESSMENT TOOL

C. Proposals for IO3– “Guidelines for Quality Assurance”

In several countries, particularly the UK, professional bodies offer accreditation for professional qualifications. Even if most universities need governmental accreditation, professional qualifications in logistic and supply chain management subjects can have an additional value for students and workers. In this respect, IO3 shall be reduced to a more compact version so as to help in accreditations for university programs based on standards of competence. Thus, contents of university programs in the field of Logistics could be continuously aligned to the needs of the labour market.

In this view, qualitative recommendations for final fine tuning of the Framework and Guidelines are grouped below on three major topics:

1. Facilitating access and understanding of Quality Assurance and Assessment Guidelines

From national and European consultations, it emerged that the structure of Guidelines is considered to be not completely accessible, especially to non-academic stakeholders. The technical language and contents should be addressed mainly to HEIs, who are more used to this kind of documents and procedures, while for business another kind of explanations need to be designed.

As to solve the raised issues on the accessibility, the Consortium performed two solutions: on one hand, the Guidelines were uploaded on the [project website](#) in a more interactive and user-friendly layout which easily allows the identification of reference gaps and related solutions and guidelines. Moreover, a visual ‘map’ of Guidelines and related Challenges was developed and it is recommended to be used in order to facilitate comprehension of the Guidelines’ framework (see Image 1).

On the other hand, in order to allow understanding, inspiration and application of these Guidelines also to non-academic stakeholders, especially referring to business and research, the Consortium agreed to develop a visual scheme in line with the above-presented map and the flyer developed as dissemination material for Multiplier events with business sector. In particular, this visual scheme should provide a logical sequence of steps that companies have to undertake in order to implement Quality Assurance culture in Knowledge Triangle for Logistics. Starting from the identified challenges and guidelines for HEIs, this scheme is aimed at ‘translating’ them in a more business-friendly language (see Image 2).

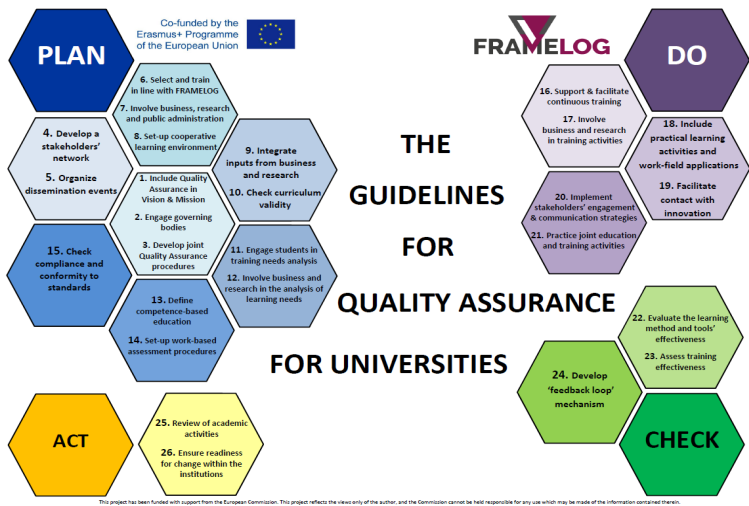


IMAGE 1 - GUIDELINES FOR ENHANCING QUALITY ASSURANCE AND ASSESSMENT FOR HEIs

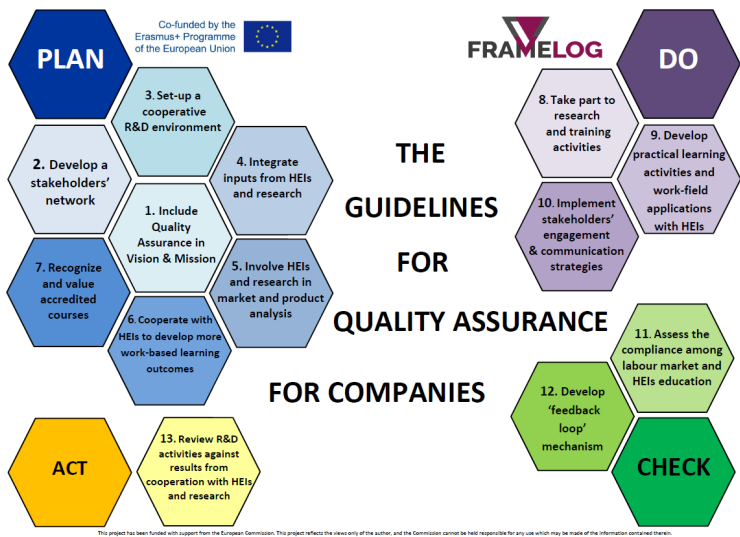


IMAGE 2 - VISUAL MAP OF O3 - QUALITY ASSURANCE AND ASSESSMENT *GUIDELINES FOR COMPANIES*

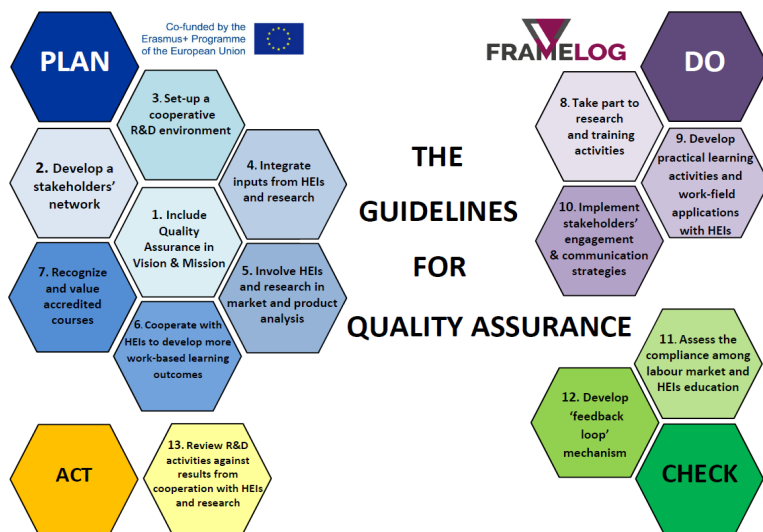


IMAGE 3 - VISUAL MAP OF GUIDELINES FOR QUALITY ASSURANCE

2. Aligning Quality Assurance and Assessment Guidelines with Quality Assurance standards for HEIs

Especially from ELA's workshop activities, participants commented that the Guidelines may represent a "surplus to requirements" already stated at academic, national or European level, resulting subsequently in a conflict with the Quality Assurance framework already existing. In order to underline the coherence of FRAMELOG Quality Assurance and Assessment Guidelines with these frameworks, the Consortium has developed a table in order to show the correspondence of this set of Guidelines to the [Standards and Guidelines for Quality Assurance in the European Higher Education Area](#) (ESG). In this way, FRAMELOG partnership hopes to clarify also the aim of these Guidelines: instead of substituting existing indicators, procedures and mechanisms already in act at academic level, FRAMELOG Quality Assurance and Assessment Guidelines provide *additional* and *sectorial* instructions in order to guide Higher Education Institutions to implement Quality Assurance processes *within the Knowledge Triangle* and *for the Logistics and Supply Chain area*. In this way,

FRAMELOG Guidelines for Quality Assurance and Assessment can be identified as ‘translators’ and ‘descriptors’ for the Logistics area of the ESG. As it would go far beyond the scope of this project to assure the alignment of FRAMELOG Quality Assurance and Assessment Guidelines with every national system, the Consortium has taken as reference system only the ESG for Internal Quality Assurance¹ in order to assure a broader comprehension and application of FRAMELOG results into different European countries.

Standards and Guidelines for Quality Assurance in European Higher Education Area	O3 - FRAMELOG Guidelines for Quality Assurance and Assessment
1. Policy for quality assurance Institutions should have a policy for quality assurance that is made public and forms part of their strategic management. Internal stakeholders should develop and implement this policy through appropriate structures and processes, while involving external stakeholders.	1. Include Quality Assurance in the HEIs, Business and Research Institutes’ strategic objectives and vision 2. Engage HEIs governing bodies in the definition and concrete implementation for the QA within the FRAMELOG 3. Develop joint Quality Assurance procedures and tools within the FRAMELOG 4. Develop and maintain a sustainable network of stakeholders to be engaged in the FRAMELOG 20. Implement the stakeholders’ engagement and communication strategies

1. Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). (2015). Brussels, Belgium, pp. 10-16).

Standards and Guidelines for Quality Assurance in European Higher Education Area	O3 - FRAMELOG Guidelines for Quality Assurance and Assessment
2. Design and approval of programmes Institutions should have processes for the design and approval of their programmes. The programmes should be designed so that they meet the objectives set for them, including the intended learning outcomes. The qualification resulting from a programme should be clearly specified and communicated, and refer to the correct level of the national qualifications framework for higher education and, consequently, to the Framework for Qualifications of the European Higher Education Area.	8. Set-up cooperative learning environment within the FRAMELOG for supporting innovation in the logistics and supply chain management area 9. Integrate the inputs received from the business and research sectors for defining joint education and training activities 10. Periodically check the validity of the curriculums based on the labour market/ research trends 18. Include appropriate practical learning activities and work-field applications in the training delivery's methods and tools
3. Student-centred learning, teaching and assessment Institutions should ensure that the programmes are delivered in a way that encourages students to take an active role in creating the learning process, and that the assessment of students reflects this approach.	11. Engage students in the training needs analysis with regards to logistics and supply chain management area 12. Active involvement of the business and research sectors in the analysis of learning needs 13. Define competence-based education and training activities 14. Set-up work-based assessment procedures and tools
4. Student admission, progression, recognition and certification Institutions should consistently apply pre-defined and published regulations covering all phases of the student "life cycle", e.g. student admission, progression, recognition and certification.	15. Check compliance and conformity of the courses according to regional/national/ European standards

Standards and Guidelines for Quality Assurance in European Higher Education Area	O3 - FRAMELOG Guidelines for Quality Assurance and Assessment
5. Teaching staff Institutions should assure themselves of the competence of their teachers. They should apply fair and transparent processes for the recruitment and development of the staff.	6. Appropriate selection and training of staff in relation to FRAMELOG implementation 16. Support and facilitate continuous training of staff in line with the market and research trends, in the logistic and supply chain management area in particular 17. Involve business and research in the updating and training activities for teachers and trainers
6. Learning resources and student support Institutions should have appropriate funding for learning and teaching activities and ensure that adequate and readily accessible learning resources and student support are provided.	7. Active involvement of business, research actors and public institutions for the provision of appropriate resources for the organizations involved in the Educational Process, particularly HEIs 19. Involve business and research in order to facilitate direct contact between students and technical innovations present in the labour market and research fields 21. Appropriate implementation of joint education and training activities
7. Information management Institutions should ensure that they collect, analyse and use relevant information for the effective management of their programmes and other activities.	22. Evaluate the learning method and tools' effectiveness against the labour and research needs
8. Public information Institutions should publish information about their activities, including programmes, which is clear, accurate, objective, up-to date and readily accessible.	5. Organize periodical events for sharing educational results achieved within the FRAMELOG

Standards and Guidelines for Quality Assurance in European Higher Education Area	O3 - FRAMELOG Guidelines for Quality Assurance and Assessment
9. On-going monitoring and periodic review of programmes Institutions should monitor and periodically review their programmes to ensure that they achieve the objectives set for them and respond to the needs of students and society. These reviews should lead to continuous improvement of the programme. Any action planned or taken as a result should be communicated to all those concerned.	23. Assess training effectiveness (use of acquired competencies in work-field context – through survey/interviews with companies and research organizations) 25. Annual review of learning programmes and activities within the FRAMELOG
10. Cyclical external quality assurance Institutions should undergo external quality assurance in line with the ESG on a cyclical basis	24. Develop and continuous update of a ‘feedback loop’ mechanism within the FRAMELOG, involving key actors from the logistic and supply chain management area

TABLE 2 - COMPARISON BETWEEN ESG STANDARDS AND FRAMELOG QUALITY ASSURANCE AND ASSESSMENT GUIDELINES

3. Integrating Quality Assurance and Assessment Guidelines into Implementation Guidelines

Another key input gathered from consultation and validation activities, is related to the convergence between Guidelines for implementing an efficient framework for Knowledge Triangle (O2-A4) and Quality Assurance and Assessment Guidelines (O3). Both Guidelines, in fact, share as founding pillar of FRAMELOG the PDCA Cycle and subsequently present a similar structure – however with different focus. Moreover, both Guidelines address Universities as common target group. As a result, it was suggested to develop a unique set of Guidelines that embeds also the Quality Assurance aspect.

In this sense, in order to facilitate this integration, the first step was to compare O3 and O2-A4 Guidelines with ESG standards to easily harmonize both indications (O3 and O2-A4) against a common validated framework for HEIs (ESG Standards) as in table below.

Trying to combine both suggestions of develop one Manual for ‘Knowledge Triangle’ implementation and the requests of having more user-friendly and schematic resources, the proposed solution is to design a step-by-step map/guidelines for HEIs with hints and examples also from Quality Assurance and Assessment Guidelines.

Standards and Guidelines for Quality Assurance in the European Higher Education Area	O3 - FRAMELOG Guidelines for Quality Assurance and Assessment	O2-A4 - Guidelines for implementing an efficient framework for Knowledge Triangle
1. Policy for quality assurance Institutions should have a policy for quality assurance that is made public and forms part of their strategic management. Internal stakeholders should develop and implement this policy through appropriate structures and processes, while involving external stakeholders.	1. Include Quality Assurance in the HEIs, Business and Research Institutes’ strategic objectives and vision 2. Engage HEIs governing bodies in the definition and concrete implementation for the QA within the FRAMELOG 3. Develop joint Quality Assurance procedures and tools within the FRAMELOG 4. Develop and maintain a sustainable network of stakeholders to be engaged in the FRAMELOG 20. Implement the stakeholders’ engagement and communication strategies	5.1. Starting the process: initiate the SWOT analysis, involve key partners and create the basic organizational structures 6.4. Disseminating outputs regarding logistic projects’ progress and results, thesis, grant agreement

Standards and Guidelines for Quality Assurance in the European Higher Education Area	O3 - FRAMELOG Guidelines for Quality Assurance and Assessment	O2-A4 - Guidelines for implementing an efficient framework for Knowledge Triangle
2. Design and approval of programmes Institutions should have processes for the design and approval of their programmes. The programmes should be designed so that they meet the objectives set for them, including the intended learning outcomes. The qualification resulting from a programme should be clearly specified and communicated, and refer to the correct level of the national qualifications framework for higher education and, consequently, to the Framework for Qualifications of the European Higher Education Area.	8. Set-up cooperative learning environment within the FRAMELOG for supporting innovation in the logistics and supply chain management area 9. Integrate the inputs received from the business and research sectors for defining joint education and training activities 10. Periodically check the validity of the curriculums based on the labour market/research trends 18. Include appropriate practical learning activities and work-field applications in the training delivery's methods and tools	6.2. Improving offer of internships and stage in logistics 6.3. Promoting thesis, Ph.D., research grants, fellowships and professorial chairs on logistics topics
3. Student-centred learning, teaching and assessment Institutions should ensure that the programmes are delivered in a way that encourages students to take an active role in creating the learning process, and that the assessment of students reflects this approach.	11. Engage students in the training needs analysis with regards to logistics and supply chain management area 12. Active involvement of the business and research sectors in the analysis of learning needs 13. Define competence-based education and training activities 14. Set-up work-based assessment procedures and tools	

Standards and Guide- lines for Quality Assur- ance in the European Higher Education Area	O3 - FRAMELOG Guide- lines for Quality Assur- ance and Assessment	O2-A4 - Guidelines for implementing an effi- cient framework for Knowledge Triangle
4. Student admission, progression, recogni- tion and certification Institutions should con- sistently apply pre-defined and published regulations covering all phases of the student “life cycle”, e.g. student admission, pro- gression, recognition and certification.	15. Check compliance and conformity of the courses according to regional/na- tional/European standards	5.4. Accrediting courses: the key process for educa- tional course alignment
5. Teaching staff Institutions should assure themselves of the com- petence of their teachers. They should apply fair and transparent processes for the recruitment and de- velopment of the staff.	6. Appropriate selection and training of staff in relation to FRAMELOG implementation 16. Support and facilitate continuous training of staff in line with the mar- ket and research trends, in the logistic and supply chain management area in particular 17. Involve business and research in the updating and training activities for teachers and trainers	

Standards and Guidelines for Quality Assurance in the European Higher Education Area	O3 - FRAMELOG Guidelines for Quality Assurance and Assessment	O2-A4 - Guidelines for implementing an efficient framework for Knowledge Triangle
6. Learning resources and student support Institutions should have appropriate funding for learning and teaching activities and ensure that adequate and readily accessible learning resources and student support are provided.	7. Active involvement of business, research actors and public institutions for the provision of appropriate resources for the organizations involved in the Educational Process, particularly HEIs 19. Involve business and research in order to facilitate direct contact between students and technical innovations present in the labour market and research fields 21. Appropriate implementation of joint education and training activities	5.2. Selecting educational disciplines, contents and methods 5.3. Embedding industry experts as teachers and/or lecturers into educational courses 6.1. Developing of joint activities with business and research entities
7. Information management Institutions should ensure that they collect, analyse and use relevant information for the effective management of their programmes and other activities.	22. Evaluate the learning method and tools' effectiveness against the labour and research needs	
8. Public information Institutions should publish information about their activities, including programmes, which is clear, accurate, objective, up-to date and readily accessible.	5. Organize periodical events for sharing educational results achieved within the FRAMELOG	

Standards and Guide- lines for Quality Assur- ance in the European Higher Education Area	O3 - FRAMELOG Guide- lines for Quality Assur- ance and Assessment	O2-A4 - Guidelines for implementing an effi- cient framework for Knowledge Triangle
9. On-going monitoring and periodic review of programmes Institutions should mon- itor and periodically re- view their programmes to ensure that they achieve the objectives set for them and respond to the needs of students and society. These reviews should lead to continuous improve- ment of the programme. Any action planned or taken as a result should be communicated to all those concerned.	23. Assess training effec- tiveness (use of acquired competencies in work- field context – through survey/interviews with companies and research organizations) 25. Annual review of learning programmes and activities within the FRAMELOG	7.1. Analyzing progress and reviewing active conjoint activities
10. Cyclical external quality assurance Institutions should under- go external quality assur- ance in line with the ESG on a cyclical basis	24. Develop and continu- ous update of a ‘feedback loop’ mechanism within the FRAMELOG, involv- ing key actors from the logistic and supply chain management area	7.2. Engagement of new potential stakeholders

TABLE 3 - COMPARISON BETWEEN ESG STANDARDS, FRAMELOG QUALITY ASSURANCE AND ASSESSMENT GUIDELINES AND FRAMELOG GUIDELINES FOR IMPLEMENTING AN EFFICIENT FRAMEWORK FOR ‘KNOWLEDGE TRIANGLE’

7. Conclusions

To conclude, following the validation with stakeholders and the discussions within the Consortium, the fine tuning of the Framelog was undertaken by operating all changes and implementing all the recommendations received. The final form of the intellectual outputs forming the European Framelog for Knowledge Triangle in Logistics has a clear

and simple form, but one of the main benefits of this project is that material in detail is supporting the short versions of the Framelog which may be accessed online very simply, if needed. The fine tuned intellectual outputs resulted can be consulted on the website of the project, www.framelog.eu.

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For Appendix 1, Authors and Contributors are those of Chapter 8

For Appendix 2, Authors are Miroslava Rakovska, BLA; Stilyana Stratieva, BLA

For Appendix 3, Authors are Sara Scipioni, UNIPI; Federico Niccolini, UNIPI; Marco Giannini, UNIPI

For Appendix 4, Author is Cristina Nicolau, UTBv, and Contributors are Cristian Pisarciuc, UTBv; Nicolae Marinescu, UTBv; Tiberiu Foris, UTBv

For Appendix 5 Authors are Nicole Geerkens, ELA; Dorothea Carvalho, ELA and Contributor is Cristina Nicolau, UTBv

Appendix 1

Quantitative instrument of research

FRAMELOG: European Framework for the 'Knowledge Triangle' in HEIs in the Logistics sector

A questionnaire for testing FRAMELOG outputs

FRAMELOG is an Erasmus+ strategic partnership project co-funded by the European Commission. Implemented from September 2016 to August 2019, it aims at enhancing higher education institutions' (HEIs') contribution to Logistics' job-market and growth by laying the bases for effective cooperation among education, innovation and business – the three sides of the Knowledge Triangle (KT).

This questionnaire focuses on identifying Logistics players' and stakeholders' opinions with regard to the most state-of-the-art intellectual outputs obtained, FRAMELOG and the Guidelines to implement the KT in HEIs and assure its quality at the same time. The data obtained are to be used in analyses, conclusions and proposals with a general character, no individual respondent of the questionnaire will be identified in the report. Moreover, we highlight the importance of the answers offered and we thank you in advance for completing this important questionnaire.

The questionnaire consists of four main parts corresponding to the phases of Quality Assurance management system: **Plan - Do - Check - Act**. With regard to every part, questions related to the **challenges** in implementing the KT, use of the **indicators** to assess quality HEIs deliver in Logistics and the **guidelines** for enhancing the cooperation level within the KT are addressed.

Q1. Which one of the three key actors of the KT do you represent?
Please tick (✓).

☐ Higher education institution ☐ Research institution ☐ Business

Q2. Which is your position in the organization you represent?.....

PLANNING

Q.3. To what extent do you think the following is a **challenge** in **plan-ning** high-quality cooperation between HEIs, businesses and research for describing HEI’s educational offer in Logistics? *Please circle the number best representing your opinion.*

Challenges	Not at all				To a great extent
Integrating the KT in Quality Assurance policies	1	2	3	4	5
Planning stakeholders’ engagement (such as: guest professors, researchers, business professionals etc.)	1	2	3	4	5
Ensuring appropriate human and material resources	1	2	3	4	5
Aligning academic offer to business requirements and innovative research	1	2	3	4	5
Implementing student-centred learning focused on what students really need in terms of knowledge, skills and competences	1	2	3	4	5
Applying competence-based approach to teaching which implies strong consideration of business requirements	1	2	3	4	5
Obtaining course accreditation by public institutions (e.g. ministries) and/or private institutions (e.g. professional bodies)	1	2	3	4	5

Q.4. To what extent do you think the following **indicators** are effective for assessing the quality of academic education on Logistics in HEIs, in its **planning** phase? *Please circle the number best representing your opinion.*

Indicators	Not at all				To a great extent
The availability of courses or exams focused on Logistics	1	2	3	4	5
The availability of dedicated staff for specific activities (curricular and extra-curricular activities) in Logistics	1	2	3	4	5
The presence of research centres for activities focused on Logistics	1	2	3	4	5
Selecting educational programmes with the collaboration of business and research	1	2	3	4	5
Definition of educational curriculum with the collaboration of business and research	1	2	3	4	5
Choosing lecturers with the collaboration of business and research	1	2	3	4	5
Selecting educational methods with the collaboration of business and research	1	2	3	4	5
Designing governance structures for strategic planning in Logistics activities (such as job fairs, collaborations etc.)	1	2	3	4	5

Q.5. To what extent do you think the following **guidelines** will help in providing high-quality cooperation between HEIs, businesses and research institutions, in the **planning** phase of education? *Please circle the number best representing your opinion.*

Guidelines	Not at all				To a great extent
Including Quality Assurance actions in the HEIs', business' and research institutes' visions & missions	1	2	3	4	5
Developing joint Quality Assurance procedures with business and research	1	2	3	4	5

Engaging HEIs' governing bodies in the definition and implementation for Quality Assurance	1	2	3	4	5
Creating governance bodies to plan educational and research activities in Logistics	1	2	3	4	5
Developing a stakeholders' network	1	2	3	4	5
Ensuring appropriate human and material resources for the implementation of FRAMELOG	1	2	3	4	5
Involving business, research and public administration for the provision of appropriate resources for HEIs	1	2	3	4	5
Integrating inputs from business and research for developing joint education and training activities	1	2	3	4	5
Engaging students in educational needs analysis with regards to Logistics	1	2	3	4	5
Involving business and research in the analysis of learning needs	1	2	3	4	5
Selecting educational disciplines, contents and methods in a collaborative framework between HEIs, business and research	1	2	3	4	5
Developing competence based education	1	2	3	4	5
Set-up work-based assessment procedures	1	2	3	4	5
Embedding industry experts as lecturers in educational courses	1	2	3	4	5
Selecting and training staff in line with FRAMELOG	1	2	3	4	5
Setting-up cooperative learning environment for supporting innovation in Logistics	1	2	3	4	5
Checking compliance and conformity of the courses according to regional/national/European standards	1	2	3	4	5
HEIs' applying for national and/or European accreditation of Logistics courses	1	2	3	4	5

PERFORMANCE

Q.6. To what extent do you think the following is a **challenge** in **performing** high-quality cooperation between HEIs, businesses and research institutions when providing education on Logistics? *Please circle the number best representing your opinion.*

Challenges	Not at all				To a great extent
Aligning professional development of teaching staff to business	1	2	3	4	5
Implementing innovative and experiential learning (laboratories, demonstrations, experiments, simulations etc.)	1	2	3	4	5
Cooperating with business and research at organization level	1	2	3	4	5

Q.7. To what extent do you think that the following **indicators** are effective for assessing the quality of academic education on Logistics in HEIs, in its **performing** phase? *Please circle the number best representing your opinion.*

Indicators	Not at all				To a great extent
Performing research activities in Logistics topics	1	2	3	4	5
Availability of conjoint research projects with business and research and provision of consultancy in Logistics to business	1	2	3	4	5
Organising events on Logistics with the cooperation of business and research	1	2	3	4	5
Coordination with business and research in offering of internships in Logistics	1	2	3	4	5

Coordination with business and re- search in developing thesis on Logis- tics topics	1	2	3	4	5
Organising visits by business profes- sionals in HEIs to deliver lectures re- lated to Logistics	1	2	3	4	5
Availability of temporary or perma- nent partnerships in Logistics with business and research institutions	1	2	3	4	5
Support provided by business and re- search institutions in relation to PhDs, scholarships, fellowships, professorial chairs in Logistics	1	2	3	4	5

Q.8. To what extent do you think the following **guidelines** will success-
fully help in providing high-quality cooperation between HEIs, busi-
nesses and research institutions, in the **performance** phase of educa-
tion? *Please circle the number best representing your opinion.*

Guidelines	Not at all				To a great extent
Supporting & facilitating continuous training for teachers and trainers ali- gned with business	1	2	3	4	5
Involving business and research in the updating and training activities for te- achers and trainers	1	2	3	4	5
Including practical learning activities and work-field applications in the education delivery methods and tools	1	2	3	4	5
Implementing stakeholders' engage- ment & communication strategies	1	2	3	4	5
Practicing conjoint education and training activities with business and research	1	2	3	4	5

Improving internships aligned with educational and business needs	1	2	3	4	5
Promoting theses, PhDs, research grants, scholarships, fellowships and professional chairs	1	2	3	4	5
Disseminating results from the cooperation	1	2	3	4	5

CHECK

Q.9. To what extent do you think the following is a **challenge** in **checking** the quality of collaboration between HEIs, businesses and research institutions? *Please circle the number best representing your opinion.*

Challenges	Not at all				To a great extent
Developing a longitudinal graduate tracking system	1	2	3	4	5
Applying feedback loops mechanisms among the three sides of the KT	1	2	3	4	5

Q.10. To what extent do you think that the following **indicators** are effective for assessing the quality of academic education in Logistics in HEIs, in its **check** phase? *Please circle the number best representing your opinion.*

Indicators	Not at all				To a great extent
Control of the alignment of the Logistics course with external partners at the end of the course	1	2	3	4	5
Employments as a result of Logistics internships/projects	1	2	3	4	5
Production of intellectual outputs (papers, patents, software etc. in Logistics).	1	2	3	4	5

Q.11. To what extent do you think the following **guidelines** will successfully help in providing high quality collaboration between HEIs, businesses and research institutions, in the **check** phase of education? *Please circle the number best representing your opinion.*

Guidelines	Not at all				To a great extent
Evaluating the learning method and tools' effectiveness against the labour and research needs	1	2	3	4	5
Measuring and assessing training effectiveness as a result of conjoint activities (use of acquired competencies at work place)	1	2	3	4	5
Developing and continuously updating 'feedback loop' mechanisms between key actors within the KT	1	2	3	4	5
Engaging potential new stakeholders	1	2	3	4	5

ACT

Q.12. To what extent do you think the following is a **challenge** in **improving** the collaboration between HEIs, businesses and research institutions? *Please circle the number best representing your opinion.*

Challenges	Not at all				To a great extent
Periodically improving/updating academic offer based on evaluation results and new market needs	1	2	3	4	5

Q.13. To what extent do you think the following **guidelines** will successfully help in providing high quality collaboration between HEIs, businesses and research institutions, in the **act** phase of education? *Please circle the number best representing your opinion.*

Guidelines	Not at all				To a great extent
Reviewing learning programmes and academic activities in line with FRA-MELOG	1	2	3	4	5
Ensuring readiness for change within the institutions	1	2	3	4	5

Q14. Could you please write down 3 topics of Logistics and Supply Chain Management you consider to be most up-to-date when planning the KT?.....
.....
.....

Thank you for your cooperation!

Appendix 2
National report for Bulgaria

1. Presentation of the logistics background in Bulgaria

1.1. Education in logistics

The state and development of logistics and supply chain management (L&SCM) knowledge and practice in a country strongly depends on the availability of the relevant professionals in this area. Although many HEIs have logistics courses in their programmes, currently there are few HEIs in Bulgaria that provide specialized high education in L&SCM (Table 1).

HEI, Faculty, Department	Degree, Programme	Field of Study
University of National and World Economy Department of Logistics and Supply Chains	Bachelor, Business Logistics Master, Business Logistics Master, Supply Chain Management PhD, Business Logistics	Economics
University of Economics – Varna Department of Industrial Business	Bachelor, Logistics Master, Logistics Management	Economics
International Business School	Master, Logistics	Economics
Naval Academy “N. Vaptsarov” Department of Management and Logistics	Bachelor, Logistics Master, Logistics	Administration and Management
National Military University “Vasil Levski” Department of Security Logistics	Bachelor, Business Logistics Bachelor, Security Logistics Master, Business Logistics Master, Security Logistics	Administration and Management
Technical University, Sofia Department of Engineering Logistic and Materials Handling and Construction Machines	Bachelor, Engineering Logistics Master, Engineering Logistics	General Engineering

HEI, Faculty, Department	Degree, Programme	Field of Study
Higher School of Transport “Todor Kableshkov”	Bachelor, Engineering Logistics and Construction Techniques	Mechanical Engineering
Faculty of Machinery and Construction Technologies in Transport	Bachelor, Management of Technical systems for Ecology and Logistics	
Faculty of Transport Man- agement	Master, Engineering Logistics and Construction Techniques	Transport, Navigation and Aviation
	Master, Transport Management and Logistics	

TABLE 1 - HEIs IN BULGARIA WHICH PROVIDE EDUCATION IN LOGISTICS

SOURCE: ADAPTED FROM BLAGOEVA, S., CURRENT PROBLEMS OF THE DEVELOPMENT OF LOGISTICS IN BULGARIA, IN: MODERN LOGISTICS – BUSINESS AND EDUCATION, CONFERENCE PROCEEDINGS, INTERNATIONAL SCIENTIFIC AND PRACTICAL CONFERENCE, UNIVERSITY OF ECONOMICS – VARNA, 19 - 20 OCTOBER 2017 PP. 23-37.

The data reveal that education in logistics is carried out in different fields of study – five HEIs educate students in the fields of economics or management and two HEIs – in the field of engineering. Most of the HEIs provide both bachelor and master degrees and only one HEI - the University of National and World Economy, offers a PhD degree in logistics. This university is also the only one with a degree in supply chain management. The limited number of HEIs that provide high education in L&SCM ensures quick professional realization of the graduates. However, the different profiles of the HEIs (Economic, Military, Naval, and Engineering) indicate quite a diverse spectrum of topics covered within the programmes and also different understanding of what logistics is.

1.2. *The Logistics performance Index for Bulgaria*

The Logistics Performance Index (LPI) is published by the World Bank every 2 years since 2007 r. It is useful for assessing the trends in the development of logistics in different parts of the world although it does not cover the whole diversity of logistics activities and functions that influence performance in logistics. LPI is calculated on the basis of six indicators²:

2. The World Bank, <https://lpi.worldbank.org/international> [Accessed 10 February 2018].

- The efficiency of customs and border management clearance (“Customs”).
- The quality of trade and transport infrastructure (“Infrastructure”).
- The ease of arranging competitively priced shipments (“Ease of arranging shipments”).
- The competence and quality of logistics services-trucking, forwarding, and customs brokerage (“Quality of logistics services”).
- The ability to track and trace consignments (“Tracking and tracing”).
- The frequency with which shipments reach consignees within scheduled or expected delivery times

Fig. 1 shows that, in general, the six LPI editions reveal a serious lag of Bulgaria by 2010 both from the leading countries and from the Eastern European EU Member States by level of the development of logistics, a significant progress in 2012, again a decline in 2014 and 2016 and an increase in 2018. What is more, in 2016 compared to 2012, Bulgaria dropped 36 positions (from the 72th) and worsened its index by 0.4 points - 2.81, which is the lowest value of the index since the beginning of its calculation 11 years ago. This data reveal that the improvement of logistics in Bulgaria for the whole period 2007-2018 is obvious but still uncertain and lacking in stability on all indicators.

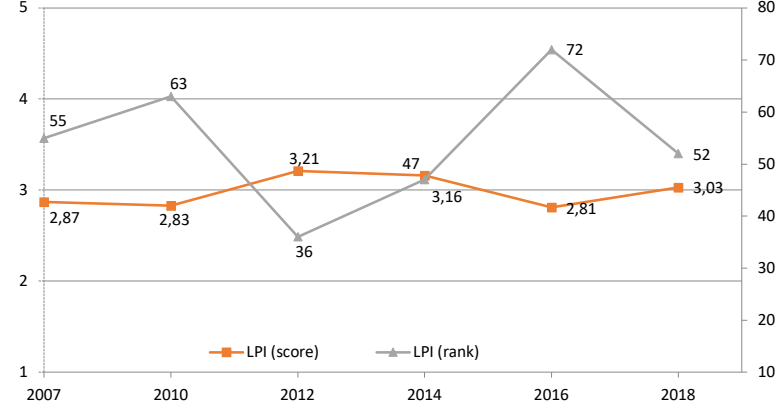


FIG. 1 - The LPI score and the rank of Bulgaria for the period 2007-2018

SOURCE: WORLD BANK (2018). FULL LPI DATASET: 2007, 2010, 2012, 2014, 2016, 2018. AVAILABLE AT: <[HTTP://LPI.WORLDBANK.ORG/](http://LPI.WORLDBANK.ORG/)> [ACCESSED 10 FEBRUARY 2018]

Table 2 and Fig. 2 present the values of the different LPI indicators for Bulgaria for the period 2007-2018. It is clear that the efficiency of the border procedures and quality of infrastructure are the lowest, with the values of the relevant indicators predominantly below 3 over the years. At the same time, the country performs best on the timeliness of deliveries and the ease of arranging international shipments, the values of these components being higher than those of the LPI.

Logistics competence is the indicator along which Bulgaria is improving in 2012-2016, but again deteriorating in 2018. The improvement over the indicated period is a favorable trend, given that in most countries the values of the logistics competence indicator are lower than the overall LPIs. It is necessary to study the reasons for the deterioration of this indicator. It may be due to the much higher recent demand for logistics specialists than the supply and the resulting need for companies to hire employees for logistics positions without the necessary competencies and skills.

On the contrary, tracking & tracing of goods shows a deterioration trend for 2014-2016 and improvement in 2018. The deterioration can be explained by the overall low level of investment in logistics information technologies and systems in the country for that period. However, as cargo tracking is becoming an increasingly bigger challenge nowadays and the available technological solutions can hardly cope with it, obviously there is a tendency to improve it.

Year	Customs	Infrastructure	International shipments	Logistics competence	Tracking & tracing	Timeliness
2007	2,47	2,47	2,79	2,86	3,14	3,56
2010	2,5	2,3	3,07	2,85	2,96	3,18
2012	2,97	3,2	3,25	3,1	3,16	3,56
2014	2,75	2,94	3,31	3	2,88	4,04
2016	2,4	2,35	2,93	3,06	2,72	3,31
2018	2,94	2,76	3,23	2,88	3,02	3,31

TABLE 2 - THE LPI INDICATORS FOR BULGARIA FOR THE PERIOD 2007-2018

SOURCE: WORLD BANK (2018). FULL LPI DATASET: 2007, 2010, 2012, 2014, 2016, 2018. AVAILABLE AT: <[HTTP://LPI.WORLDBANK.ORG/](http://lpi.worldbank.org/)> [ACCESSED 10 FEBRUARY 2018]

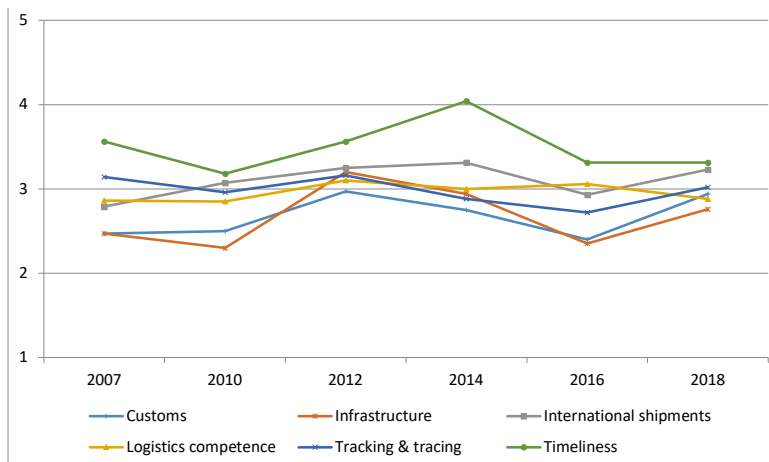


FIG. 2 - THE LPI INDICATORS FOR BULGARIA FOR THE PERIOD 2007-2018

SOURCE: WORLD BANK (2018). FULL LPI DATASET: 2007, 2010, 2012, 2014, 2016, 2018. AVAILABLE AT: <[HTTP://LPI.WORLDBANK.ORG/](http://lpi.worldbank.org/)> [ACCESSED 10 FEBRUARY 2018]

In conclusion, it can be summarized that, despite the serious lag of Bulgaria by 2010 compared both to the leading countries and the Eastern European EU Member States by level of logistics development, the country catches significantly in 2012 on all dimensions of the logistics performance. Although there is a decline again in 2014 and 2016, the increase in 2018 shows that the improvement of logistics in Bulgaria is obvious but still uncertain and lacking in stability on all indicators. Changes in the logistics performance in Bulgaria are mainly due to changes in the state of customs procedures and infrastructure and, to a lesser extent, to logistics competence. In the latest edition of the LPI all indicators with the exception of logistics competence are marked with improvement. This requires measures to improve logistics training to prevent worsening of the logistics customer service.

2. Findings from the quantitative data analysis: stakeholders' consultations on the FRAMELOG

2.1. Univariate analysis: Description of the sample population

The total number of respondents involved in the Bulgarian survey is 27. The majority of respondents (85%) are representatives of business organizations (on positions like: transport and logistic manager; distribution and sales manager; planner; project manager; logistics specialist; procurement coordinator; etc.). 11% of respondents represent HEIs (on positions like: associate professor and assistant professor), and 4% – research institutions (on positions like: researcher).

2.2. Bivariate analysis: Sample population's responses to the questions

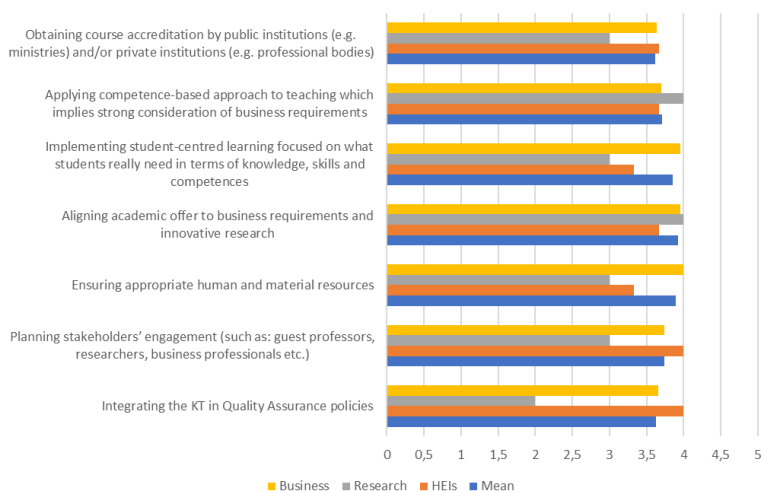


FIG. 3 - CHALLENGES IN PLANNING HIGH-QUALITY COOPERATION

Fig. 3 shows the results of the analysis of the challenges in planning high-quality cooperation between HEIs, business and research for describing HEI's educational offer in Logistics. All of the items receive mean values over 3.5 which shows that all of them were found to be a

challenges in planning cooperation. The main challenges are related to ensuring appropriate human and material resources and aligning academic offer to business requirements and innovative research. However, stakeholders in KT (business, research and HEIs) do not have similar perception of them. Thus, HEIs see integrating the KT in Quality Assurance policies and planning stakeholders’ engagement (such as: guest professors, researchers, business professionals etc.) as the primary challenges in planning the cooperation (scores above 4), while ensuring appropriate human and material resources is the top challenge for business organizations. This result is not surprising, however, because HEIs are those that are directly responsible for the development of quality assurance policies on education and planning stakeholders’ engagement requires the coordination with education activities and with set timetables.

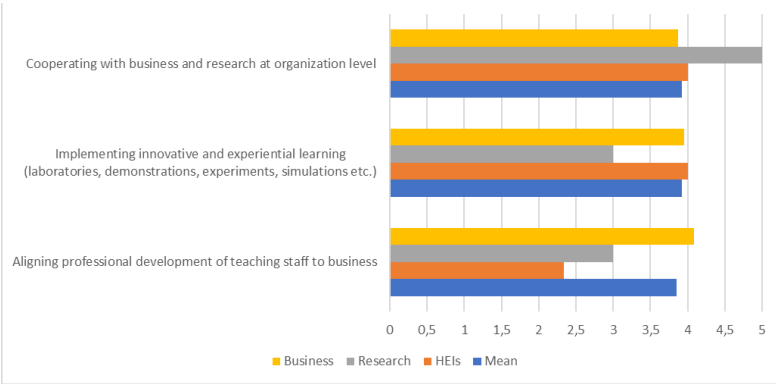


FIG. 4 - CHALLENGES IN PERFORMING HIGH-QUALITY COOPERATION

Regarding the results of the analysis of the challenges in performing high-quality cooperation (Fig. 4), it can be noticed that the mean scores for all these challenges are close to 4 on a 5-point scale. While the respondents completely agree that cooperation with business and research at organization level is one of the greatest challenges for all of the KT’s actors, there are some differences between KT’s stakeholders’ perception of implementing innovative and experiential learning (laboratories, demonstrations, experiments, simulations etc.) and aligning

professional development of teaching staff to business. The business point out as a major challenge the alignment of the teaching staff's professional development to business (above 4), while HEIs do not consider it as a problem. However, both parties agree that many of the difficulties in performing high-quality cooperation can be encountered when it comes to implementation of innovative and experiential learning (4).

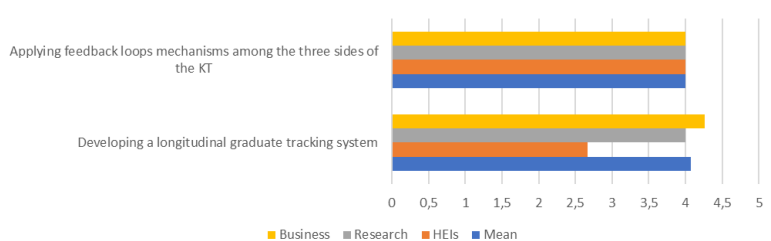


FIG. 5 - CHALLENGES IN CHECKING HIGH-QUALITY COOPERATION

More than 70% of the respondents indicate that applying feedback loops mechanisms among the three sides of the KT and developing a longitudinal graduate tracking system are very challenging in checking cooperation (Fig. 5). However, only HEIs do not demonstrate that developing a longitudinal graduate tracking system leads to some difficulties.

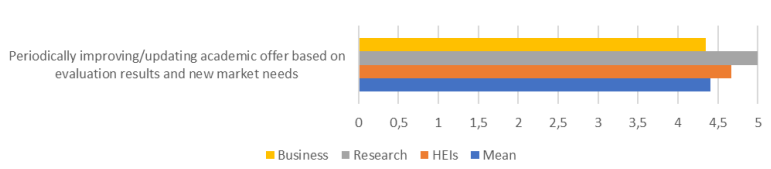


FIG. 6 - CHALLENGES IN IMPROVING HIGH-QUALITY COOPERATION

Almost all of the respondents (93%) reported as a challenge in improving cooperation the periodical improvement/update of the academic offer based on evaluation results and new market needs (Fig. 6).

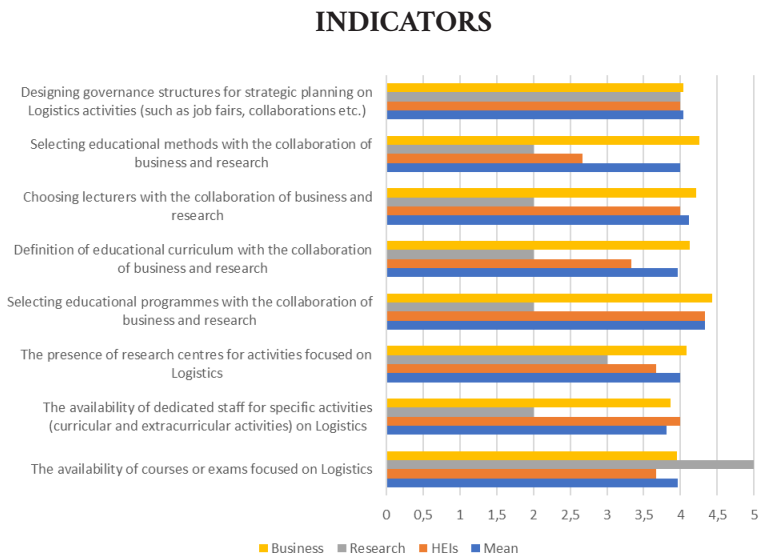


FIG. 7 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN THE PLANNING PHASE

Fig. 7 reveals that all of the listed indicators are considered effective for assessing the quality of academic education in logistics in HEIs in its planning phase (mean scores around 4 and above). While the results show some similarities between the perceptions of HEIs and business, those of the researchers indicate that just a few of them may be helpful in the evaluation of the quality of academic education in logistics: the availability of courses or exams focused on logistics (4) and designing governance structures for strategic planning on logistics activities (5).

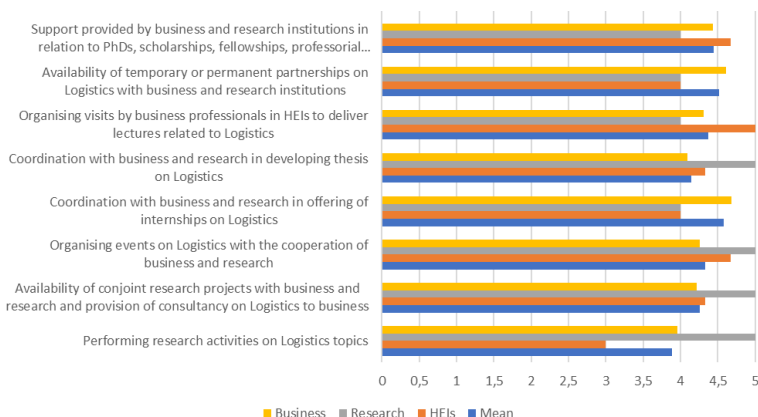


FIG. 8 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN THE PERFORMING PHASE

The results are similar as the above ones regarding the analysis of the effectiveness of the indicators in assessing the quality of education in logistics in the performing phase (mean scores around 4 and above, fig. 8). There are differences mostly in the mean scores related to the indicators concerning research activities. The research representatives indicate that the most effective indicators are: performing research activities in logistics topics (5); coordination with business and research in developing thesis in logistics (5); availability of conjoint research projects with business and research and provision of consultancy in logistics to business (5); and organising events in logistics with the cooperation of business and research (5). This result is not surprising because researchers' activities are predominantly concentrated on research and not on education.

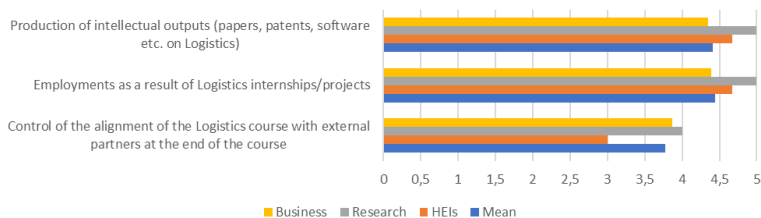


FIG. 9 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN THE CHECKING PHASE

Among all respondents, “employments as a result of logistics internships/projects” topped the list of key indicators in assessing the quality of education in logistics in the checking phase (4.44), followed by “production of intellectual outputs (papers, patents, software etc. on Logistics)” (4.41), while „control of the alignment of the logistics course with external partners at the end of the course“ is considered as the least effective (3.78). A possible explanation to this finding may be due to the fact that there exist other indicators (other than control of the alignment of the logistics course with external partners at the end of the course) that are more appropriate for assessing the quality of education such as the level of graduate employability, graduate’s match between acquired and required competences, etc.

GUIDELINES

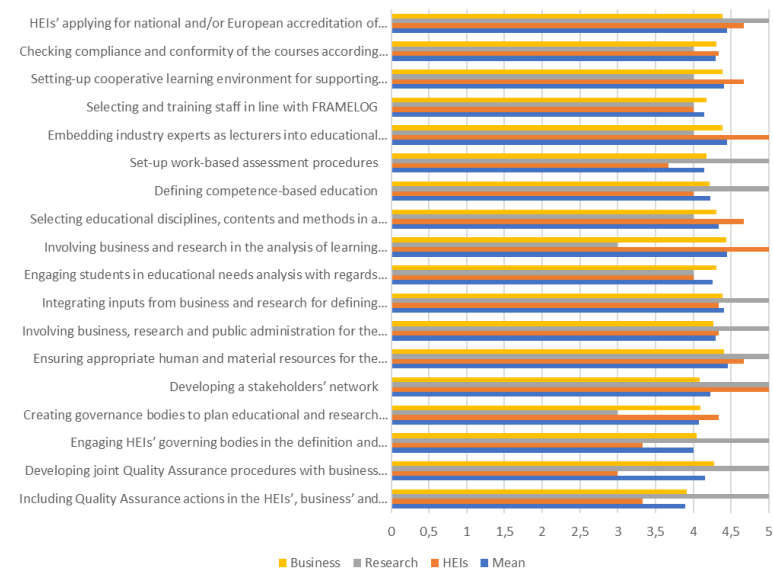


FIG. 10 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN THE PLANNING PHASE

Fig. 10 provides evidence that all of the guidelines are considered important and applicable for providing high-quality education in logistics in the planning phase. However, the primary guidelines are related to orientation toward practice, availability of appropriate resources and accreditation of the courses. Concretely, these variables are: involving business and research in the analysis of learning needs; embedding industry experts as lecturers into educational courses; HEIs' applying for national and/or European accreditation of Logistics courses; and ensuring appropriate human and material resources. When comparing the mean scores of the three groups (business, research and HEIs), it is found that they differ between Research and HEIs, which is due to their different profiles.

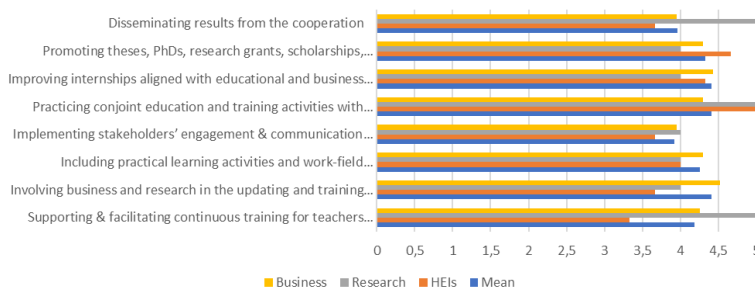


FIG. 11 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN THE PERFORMING PHASE

According to the respondents all the guidelines play an obvious and important role in in providing high-quality education in logistics in the performing phase. Furthermore, based on the results shown in Fig. 10 and in Fig. 11, it can be noted that the mean scores of the guidelines are correlated with those of the challenges. Besides, similarly to the results obtained for the challenges in the performing phase, only the business organizations mention the need for continued screening of the teachers' and trainers' competency, while the results for the HEIs are the opposite.

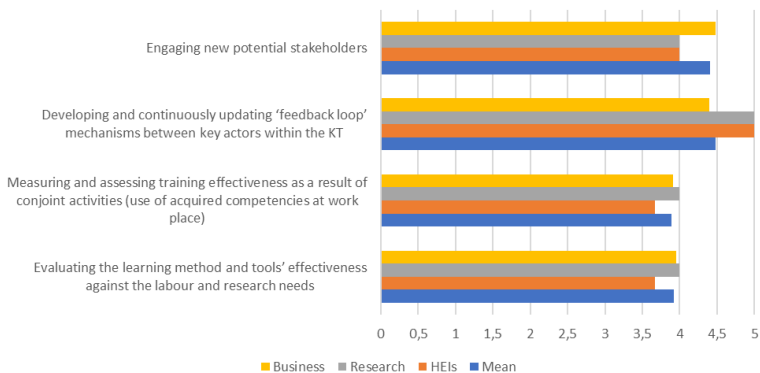


FIG. 12 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN THE CHECKING PHASE

The respondents were asked to indicate on a five-point Likert scale (1 – not at all; 5 – to a great extent) the guidelines that would help in providing high quality collaboration between HEIs, businesses and research institutions in the checking phase. The results show that two of the guidelines are especially relevant (scored above 4). These are the engagement of new potential stakeholders and development and continuous update of the ‘feedback loop’ mechanisms between key actors within the KT. Furthermore, there is a general consensus amongst the respondents on these guidelines (the participants’ perceptions of the guidelines tend to gravitate toward the mean).

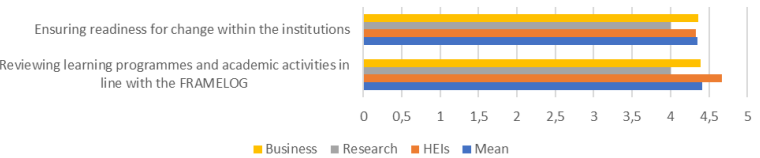


FIG. 13 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN THE ACT PHASE

Almost all of the respondents (96%) reported that reviewing learning programmes and academic activities in line with the FRAMELOG and

ensuring readiness for change are needed in order to provide high-quality education in logistics in the act phase.

3. Conclusions at national level

It can be summarised that most of the Bulgarian respondents actually do not view as too big the challenges in planning the cooperation between HEIs, business and research, while the scores for the indicators and for the guidelines in all of the four phases (PDCA cycle) are quite high (around 4 and above).

Although there is a high degree of consensus on most of the surveyed items, the results show some differences in the perception of the KT's stakeholders about the challenges, indicators and guidelines, which can be explained mostly by the difference in their profiles, motives for cooperation and expectations.

Most of the recommendations received at the end of the last question "Could you please write down 3 topics of Logistics and Supply Chain Management you consider to be most up-to-date when planning the KT?" are as follows:

- Focusing more on developing courses in sustainable supply chain management, digital transformation, big data, etc;
- HEIs need help from business in implementing innovative and experiential learning (laboratories, demonstrations, experiments, simulations etc.);
- Need of regulatory mechanisms to facilitate and support the interaction among KT's actors.

Appendix 3

National report for Italy

1. Introduction

This national report presents the results of the research made by the project members in order to validate the intellectual outputs produced, more precisely the Framework in the Knowledge Triangle in Logistics (O2) and the Guidelines for Assessing and Assuring Quality (O3), in the Italian context.

In particular, the testing activity was carried out on 18th January 2019 in the Room Library “Maurizio Caponi” inside the “Polo Universitario Sistemi Logistici” of the University of Pisa (located in Livorno, Italy), with a workshop entitled “*FRAMELOG: Knowledge creation processes, methods and tools for market oriented-competences in logistics*”. In that occasion, stakeholders from HEIs, Research centres, Companies and Students in Logistics were invited to share their opinion regarding the topics inserted in the FRAMELOG Questionnaire.

In the present Report, first, we provide an overall but not exhaustive description of the educational state-of-art in Logistics and Supply Chain Management courses in Italy; secondly, we analyze the Italian Logistics Performance Index, helpful in assessing the need for developing education in Logistics.

As main part of the document, in Section 3 we present the methodology and data collected with the questionnaire, especially designed for determining Framelog stakeholders’ opinions regarding the project outputs and the suggestions collected from them for their final tuning.

2. Overall description of higher education offers on Logistic topics in Italy and Italian Logistics Performance Index

Recent studies analyzed the state-of-art of higher educational offer in Logistics in Italy, focusing of its potentiality in reacting to the challenges related to the changing market. It has been highlighted that the Italian Bachelor and Master University Degrees offered by both Economics and Engineering Departments, mainly focus on

a cluster of technical and managerial topics, such as Supply Chain Design, Inventory Control, Transport, Warehousing and Demand and Strategic Planning. Other covered topics concern Supply management, Logistic Performance Measurement, Logistic cost, the so-call Reverse Logistics, Customer Services, Outsourcing and Risk management. The specific contents offered in the two different Departments are slightly different but with a similar distribution of managerial and operational topics taught. The Table shown after summarize the data.

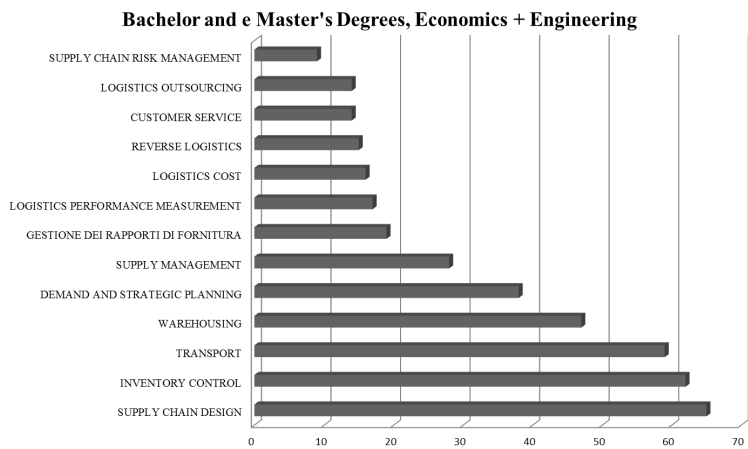


FIG. 1 - TOTAL NUMBERS OF COURSES IDENTIFIED IN THE SCHOOLS OF ECONOMICS AND ENGINEERING OF ITALIAN UNIVERSITIES (BACHELOR'S AND MASTER'S DEGREES)

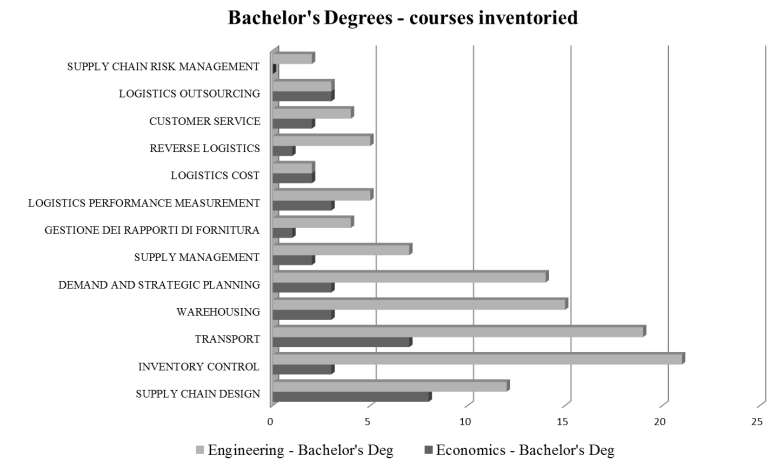


FIG. 2 - COURSES IDENTIFIED IN THE SCHOOLS OF ECONOMICS AND OF ENGINEERING OF ITALIAN UNIVERSITIES (BACHELOR'S DEGREES)

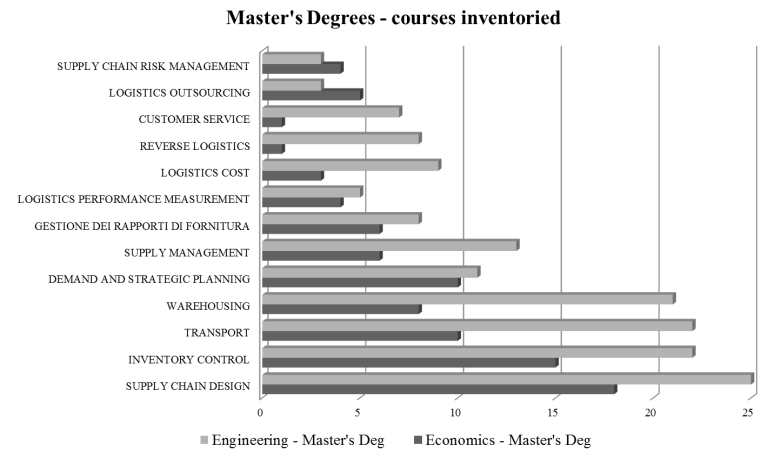


FIG. 3 - COURSES IDENTIFIED IN THE SCHOOLS OF ECONOMICS AND OF ENGINEERING OF ITALIAN UNIVERSITIES (MASTER'S DEGREES)³

3. From Giannini, M. "A comparison between the Italian universities curricula in logistics & SCM and the professionals' needs", International Conference in Industrial Logistics 2018, Israel, 2018.

The presented extract from scientific studies reflects the prominent position that Logistics covers in the Italian industrial economy, reflected by the increasingly higher position which the country covers in the Logistic Performance Index in the last evaluated available period (2007-2018).

In fact, starting from a 29th position in 2007, with a 3,19 LPI score, Italy is actually positioned at the 19th rank with a LPI score of 3,76. Even if in 2012 there was a little drop respectfull the average position increment (from 22nd to 24th position), the normalized trend seems to show a constant improvement in the logistic performance of Italian industries.

In the Figure below, the two-yearly based Italian scores and related rankings are shown.



FIG. 4 - THE ITALIAN LPI SCORES AND RANKS FOR THE PERIOD 2007-2018

SOURCE: ELABORATION OF THE AUTHORS FROM LPI DATA

Analyzing the data in details, considering the period 2010-2018 in which the indicators estimated have the same characteristics, it is possible to assess slightly different trends in the LPI indicators for the Italian country.

In particular, Timeliness together with Infrastructure and Customs present a constant improvement in the considered timeline while Quality Logistics Services and International Shipment encountered from 2016 a light decrease in their score. Tracking and Tracing shows almost a constancy in its values from 2014 until today.

The following Tables and Fig. 5 present the complete data of Italian LPI indicators for the considered timeline.

Year	Overall LPI Score	Customs	Infrastructure	Ease of Shipment	Logistics Services	Ease of Tracking	Domestic Logistics Costs	Timeliness
2007	3,58	3,19	3,52	3,57	3,63	3,66	2,39	3,93

TABLE 1 - THE ITALIAN LPI INDICATORS FOR ITALY IN 2007

Year	Overall LPI Score	Customs	Infrastructure	International Shipments	Quality Logistics Services	Tracking and Tracing	Timeliness
2018	3,74	3,47	3,85	3,51	3,66	3,85	4,13
2016	3,76	3,45	3,79	3,65	3,77	3,86	4,03
2014	3,69	3,36	3,78	3,54	3,62	3,84	4,05
2012	3,67	3,34	3,74	3,53	3,65	3,73	4,05
2010	3,64	3,38	3,72	3,21	3,74	3,83	4,08

TABLE 2 - THE ITALIAN LPI INDICATORS FOR ITALY IN THE PERIOD 2010-2018

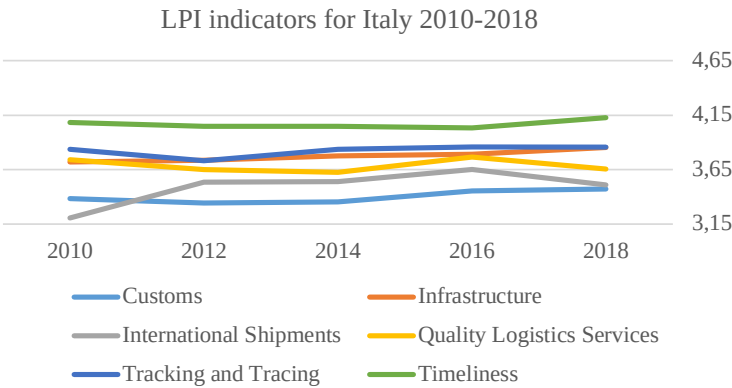


FIG. 5 - THE ITALIAN LPI INDICATORS FOR THE PERIOD 2010-2018

SOURCE: ELABORATION OF THE AUTHORS FROM LPI DATA

In conclusion, it can be highlighted that the relevance of Logistics in Italy can be confirmed both by:

- industrial activities and related performance, that are on the whole increasing in terms of values and socio-economic impacts;
- investments in terms of scientific research and educational offer, in particular from higher educational institutions that present a comprehensive pattern of courses focused on operational and managerial competence-oriented topics.

With the presentation of Italian testing activities results, we aim to contribute in understanding if the FRAMELOG proposed theories, methods and instruments are perceived by its Italian key stakeholders as effective at improving the collaboration patterns among the three angles of the Knowledge Triangle, with the final aim of enhancing the competences formation of students and workers in Logistics.

Bibliography

Giannini, M. "A comparison between the Italian universities curricula in logistics & SCM and the professionals' needs", International Conference in Industrial Logistics 2018, Israel, 2018.

World bank (2018). Full LPI Dataset: 2007, 2010, 2012, 2014, 2016, 2018. Available at: <<http://lpi.worldbank.org/>> [Accessed 25th February 2018].

3. Findings from the quantitative data analysis: stakeholders' consultations on FRAMELOG

As already mentioned in the Introduction, the consultations with FRAMELOG Italian Stakeholders took place between the end of 2018 and January 2019.

As first step, the participants were identified according to the required profile of the national testing activities; in particular, HEIs representatives were invited as main target, with a balance between professors and administrative responsible persons.

Together with them, researchers and businessmen in the Logistic area participate to the event, to consider also the other two "angles"

of the Triangle. The decision to include also Bachelor and Master students in Logistic was made to understand their opinion regarding the FRAMELOG tools, since they represent the final beneficiary of the overall project.

The 47 Italian workshop participants are represented in the Tables below:

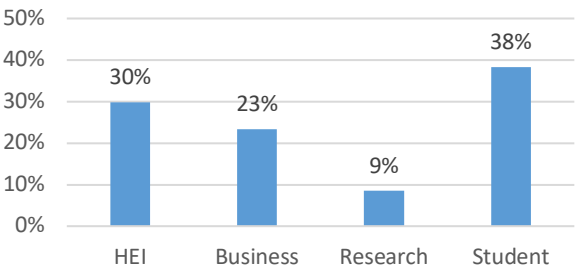


TABLE 3 - ITALIAN WORKSHOP PARTICIPANTS' PROFILE

Profile	Sub profile	%
Business		23%
HEI	Administrative office	13%
HEI	Professor	17%
Research		9%
Student		38%

TABLE 4 - ITALIAN WORKSHOP PARTICIPANTS' SUB-PROFILE

Secondly, to enhance the communication among the audience, it was decided to translate the FRAMELOG survey into Italian; a first translation was pre-tested among three people with different profiles (academic professor, researcher, business representative) and the final enhanced version was prepared to be shared. The translated version of the survey can be found in Annex III.

Then, to gather primary data before the event, this translated version of the survey was sent out to the confirmed participants, who were

asked to fill it in prior the Workshop. This preliminary data collection and analysis enabled the University of Pisa to highlight some of the most controversial subjects on which the discussion would be focused on; in fact, on some topics the collected scores were opposite.

During the event, two discussion tables were opened, focused on two different sections of the questionnaire, in order to deeply analyse their contents; in this way, both qualitative comments and other filled surveys were collected to contribute to the quantitative analysis.

Hereafter, the visual representation of the activities carried on for the presented testing activity.

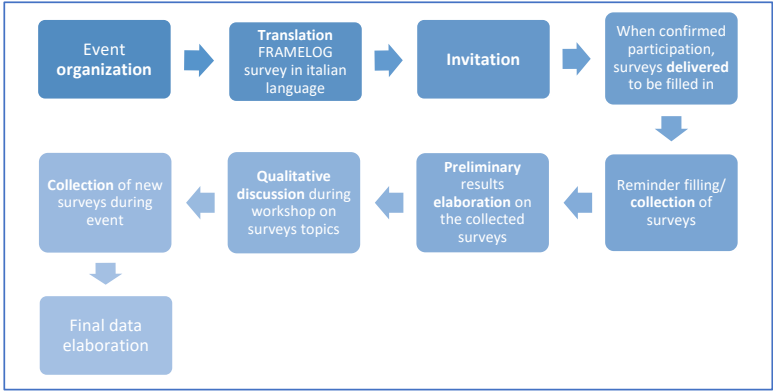


FIG. 6 - ITALIAN WORKSHOP AND TESTING ACTIVITY FLOW

For the analysis, 35 fully-answered questionnaires were considered, of which:

- 26 % represents HEIs (on positions like professor in Logistics);
- 23 % Business (on positions like project planner);
- 6 % Research Institutions (on positions like contracted researcher) and
- 46 % Bachelor and Master Students in Logistics.

as shown in the following Table.

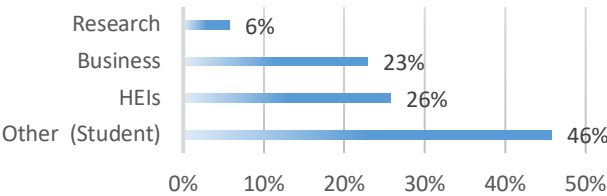


TABLE 5 - ITALIAN WORKSHOP RESPONDENTS’ PROFILE

The respondents were asked to indicate on a five-point Likert scale (1 – not at all; 5 – to a great extent) to different questions arranged according to the Deming Wheel pattern (Planning-Performing-Checking-Acting), as already explained in the introduction of the report.

Going into the details of the answers, in the following paragraphs the results per each section of the survey are presented.

CHALLENGES

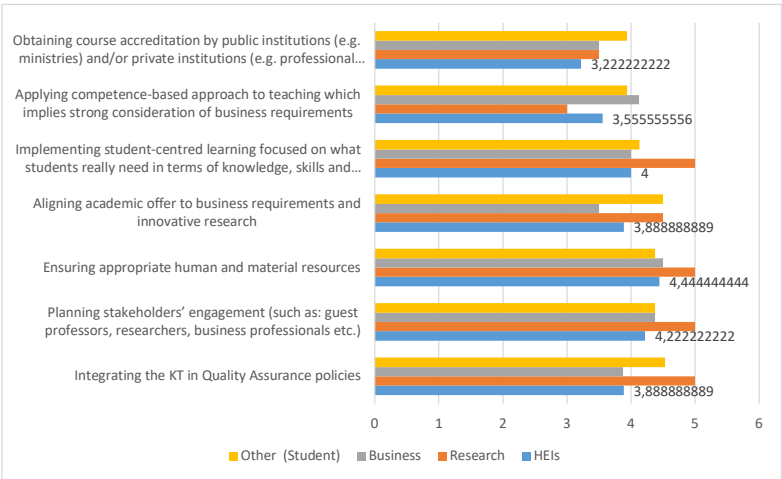


FIG. 7 - CHALLENGES IN PLANNING HIGH-QUALITY COOPERATION

The Figure above shows the results of the analysis of the challenges in planning high-quality cooperation between HEIs, business and research

for describing HEI's educational offer in Logistics. All of the items received mean values over 4, which shows that all of them were considered as very important challenges in the planning stage of cooperation. The main challenges are related to:

- Ensuring appropriate human and material resources to be invested in cooperation activities, which scored above 4,5 as average answer;
- Planning a fruitful stakeholder engagement between HEIs, business and research, that recorded an average answer of 4,5;
- Implementing student-centred learning focused on what students really need in terms of knowledge, skills and competences, that scored 4,2 on average between the different respondents' profiles.

Going into details of specific clusters' response, we can highlight a slightly major propensity of HEIs representatives the integration of the Knowledge Triangle perspective into Quality Assurance policies as well as the alignment of academic offer to business requirements. Those aspects can be explained thanks to the different importance that diverse stakeholders' profiles can associate with quality assurance and cooperation for educational activities. In particular, as recorded from the open discussion session held during the Italian workshop, for professionals and associations quality remains an important topic but the quite long administrative process that can be encountered for the accreditation and the alignment to formal requirements typical of public institutions may interfere with the effectiveness of the cooperation. For those reasons, they indicated lower scores on those aspects, and higher on more practical challenges, as the guarantee of adequate resources.

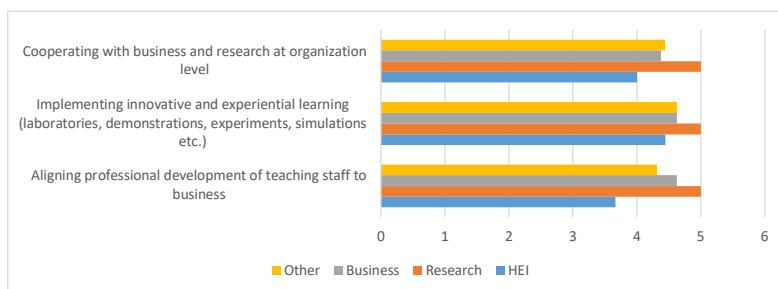


FIG. 8 - CHALLENGES IN PERFORMING HIGH-QUALITY COOPERATION

Regarding the results of the analysis of the challenges in performing high-quality cooperation, shown in the Table above, it can be noticed that the mean scores for all these challenges are above 4,5 on a 5-point scale. Going in details, even all three categories affirm that the implementation of innovative and experiential learning remains the main challenges, on the other challenges some differences can be highlighted. In fact, HEIs representatives indicated lower scores to cooperation with business and research (3,6) and alignment of teaching to business requirements (4) respectful to business and research ones. Also for this aspect, the institutional differences between the subjects involved seem to be the most relevant issue in performing high-quality cooperation; as every completely public or partly public institutions, the Italian High Educational Institutions present severe rules for implementing new collaboration and changes in educational courses contents. This aspect was considered very relevant to be considered in implementing collaboration strategies.

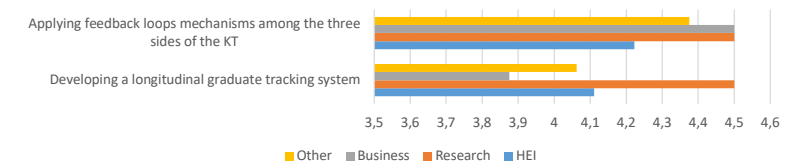


FIG. 9 - CHALLENGES IN CHECKING HIGH-QUALITY COOPERATION

While the three categories agree that applying feedback loops mechanisms among the three sides of the KT is very challenging in checking cooperation, a relevant difference between them was recorded regarding the second challenge, as shown in the Table above. In fact, even if for Research and HEIs the development of a longitudinal graduate tracking system is still considered a challenge, this element is not perceived by business representatives.

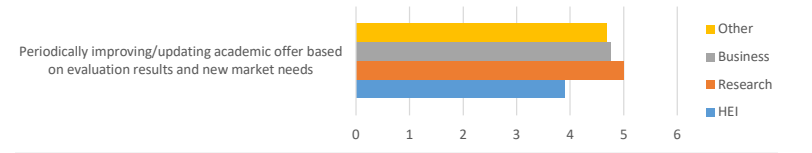


FIG. 10 - CHALLENGES IN IMPROVING HIGH-QUALITY COOPERATION

Finally, for the overall improvement of a high-quality cooperation, the average answer of more than 4,5 indicate that the periodical improvement and updating of academic offer according to evaluation results and new market needs can be confirmed as a relevant challenge to be faced in planning and performing collaboration activities among education, business and research in Logistics.

INDICATORS

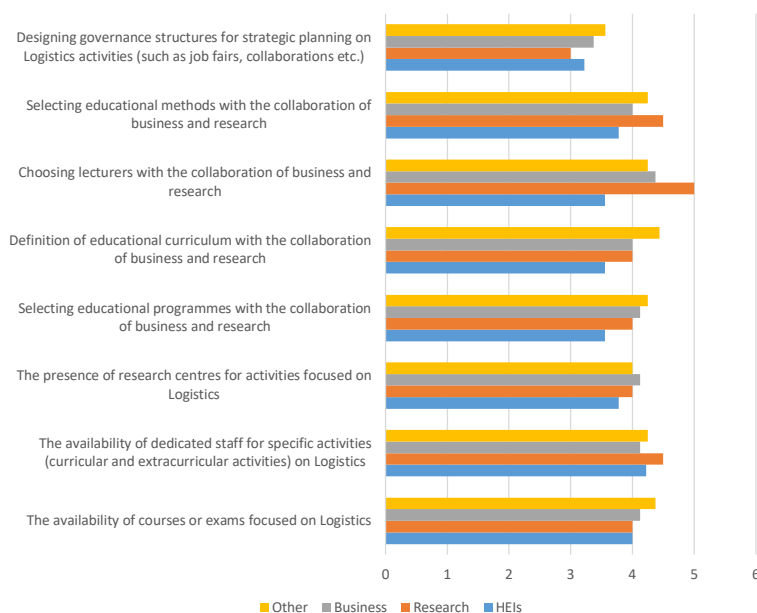


FIG. 11 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN PLANNING PHASE

The Table above reveals that all of the listed indicators are considered effective for assessing the quality of academic education in logistics in HEIs in its planning phase (mean scores of 3,96 points). Among the indicators, some slightly differences can be underlined between HEIs and business representatives; in particular, for business and research the insertion of professional interventions inside academic courses seems to be really relevant (3,75 and 5 points) for their contribution of real working

experiences to theoretical lectures. For the lower relevance given from HEIs to the conjoint selection of educational contents, methods and programmes respectful to business, the small flexibility of the public educational system seems to give few spaces for real improvement at single-course level. A possible solution emerged from the open discussion could be to move this approach at central institution level, to be generally applied to a whole University or College, not only towards Logistic courses. Obviously, the higher impact this action can be would be associated with a longer timing and effort from the institutional personnel.

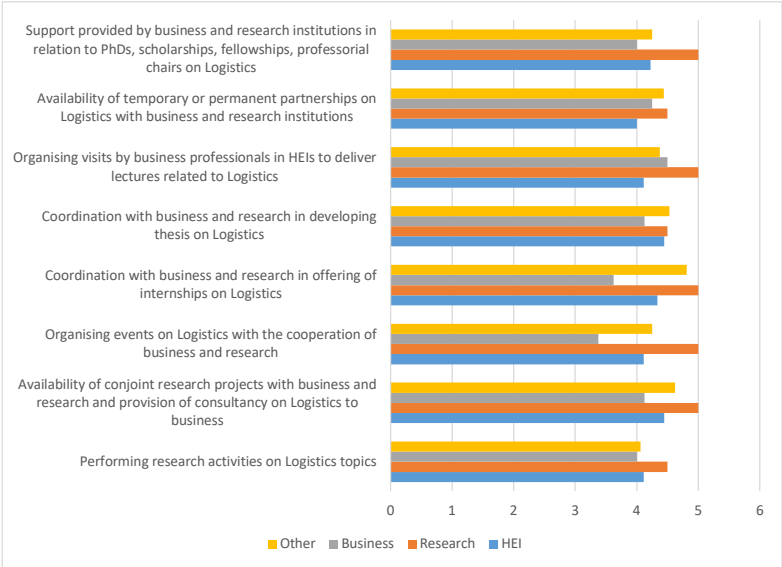


FIG. 12 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN PERFORMING PHASE

Moving to the other cluster of indicators, the results regarding the analysis of the effectiveness of the indicators in assessing the quality of education in logistics in the performing phase are similar as the above ones, with a mean scores above 4 points (Table above).

Among the presented indicators, the following ones were considered as the most relevant:

- “Organising visits by business professionals in HEIs to deliver lectures related to Logistics”, which scored 4,53 on average;
- “Availability of conjoint research projects with business and research and provision of consultancy on Logistics to business”, with average score of 4,52;
- “Support provided by business and research institutions in relation to PhDs, scholarships, fellowships, professorial chairs on Logistics”, with 4,41 of average score.

From the qualitative comments collected during the event in Livorno, the first indicator seemed to be relevant for its potentiality of enabling students to learn for real business experiences, while the second for enacting tangible intellectual productions for both educational, business and innovation purposes. The last high-ranked indicator focused more on special funds that should be positively allocated for the economic support of the above-mentioned activities and production.

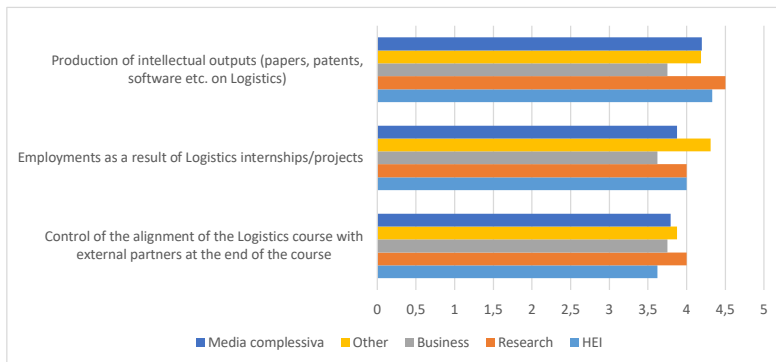


FIG. 13 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN CHECKING PHASE

Going to the last section of indicators, the Table above shows the evaluated indicator for assessing the quality of education in Logistic in the checking phase. Aligned to the other section, also here the “Production of intellectual outputs”, such as paper, patents and software for Logistic-oriented purposes or topics, scored higher than the other indicators, with an average score of 4,20. Even if with slightly lower scores, also the other controlling activities were considered relevant for

guaranteeing the quality of the collaboration among the KT, both with 3,8 average scores:

- Employments as a result of Logistics internships/projects;
- Control of the alignment of the Logistics course with external partners at the end of the course.

In this respect, the results confirm that is not only the right planning and performing of an activity that assure its effectiveness, but also the success of the final evaluation of that one compared to the set-up requirements.

GUIDELINES

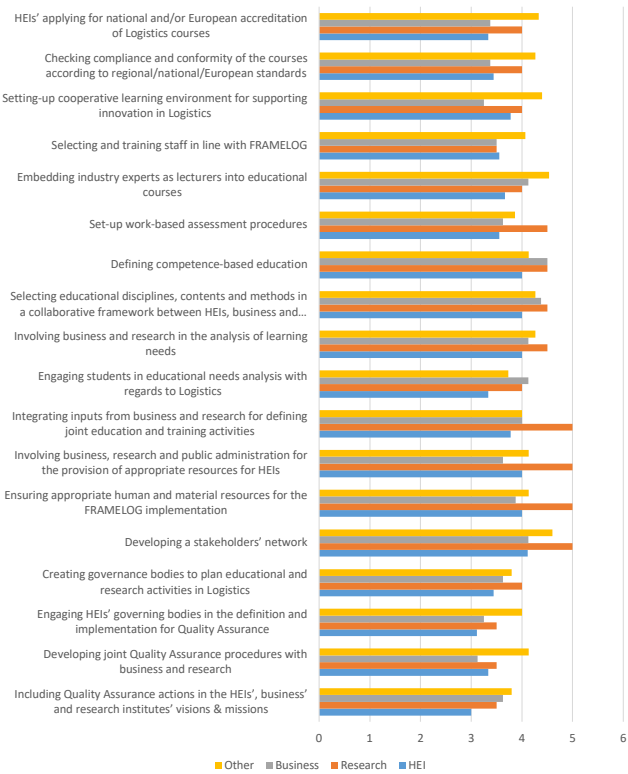


FIG. 14 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN PLANNING PHASE

Moving to the Guidelines assessment analysis, as shown in the Table above, the overall evaluation of the presented Guidelines for planning a high-quality collaboration between the three angles of the Knowledge Triangle was very positive, with an average score of 3,87.

In particular, the highest score was assigned to the Guideline related to the development of a stakeholders' network, to give birth to temporary and permanent collaboration. In this respect, it is relevant to highlight that for this aspect the FRAMELOG Stakeholder Engagement Plan developed in the context of the Consortium includes strategies, actions and practical indication on how to effectively develop such network inside the Logistic area.

Another Guidelines which was considered relevant was the one related on "How to define a competence-based education system", which should be aligned to business and research requirements: this guideline scored 4,33 on average.

Meeting the results reported for the planning phase, also in this section a high importance was given to the Guideline focused on how to "Ensure appropriate human and material resources for the FRAMELOG implementation", which still represents the critical aspect for the enactment of collaboration activities.

Compared to the other guidelines scores, the lowest (but generally still high) results was associated to the engagement of HEIs' governing bodies in the definition and implementation of Quality Assurance policies. This results remain related to the little room for manoeuvre that HEIs have in making radical institutional changes.

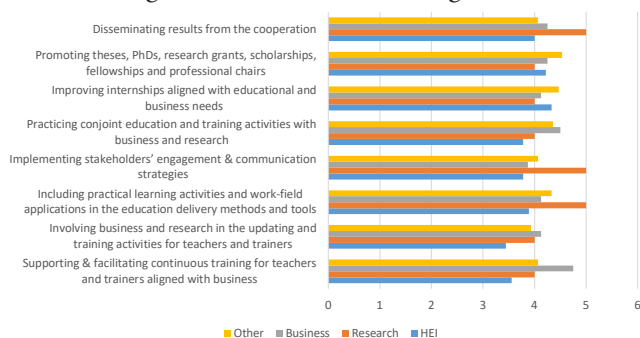


FIG. 15 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN PERFORMANCE PHASE

In performing the collaboration activities, the most appreciated guidelines that would potentially represent a real help in boosting collaboration among KT organizations were the followings:

- How to disseminate results from the cooperation, which scored 4,41;
- How to include practical learning activities and work-field applications in the education delivery methods and tools, with an average score of 4,33 points;

How to implement stakeholders’ engagement & communication strategies, which presents an average score of 4,22.

Going into details, the highest-ranked guidelines shows the relevance not only of setting and performing collaboration, but also of sharing the produced results and good practices among peers and, generally, to stakeholders. The second guideline shows the business need of “receiving” students from HEIs who would be practical-oriented and skilled for work-field without further in-company training, while the third one remains focused on stakeholder engagement and communication strategies to be practically implemented for ensuring correct cooperation.

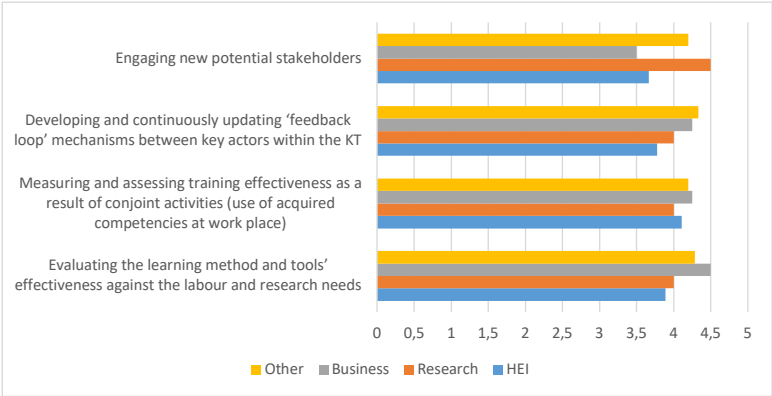


FIG. 16 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN CHECK PHASE

Regarding the checking phase, the high average score of 4 points confirms the overall positive evaluation of the presented guidelines. Analysing the specific differences, the highest evaluation was given to

the guideline focused on “Evaluating the learning method and tools’ effectiveness against the labour and research needs”, with an average score of 4,13. This aspect reflects the ideal constant renovating process that the educational offer should make to remain aligned to labour market needs, especially in the constantly changing Logistic area.

Another high-scored guidelines was the one that indicate how to “Measure and assess training effectiveness as a result of conjoint activities”, in particular assessing the real use of acquired competencies at the work place. This guideline scored 4,12 on average and indicate the attention given to the checking phase.

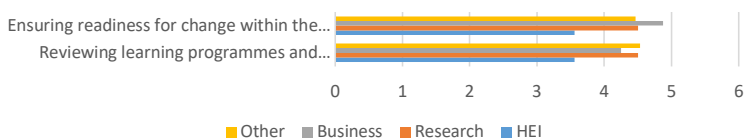


FIG. 17 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN ACT PHASE

As final section, the analysis of the results related to the assessment of FRAMELOG Guidelines for the “act” (or “enhancement”) phase shows the overall positive evaluation of them, with an average score of 4,21. This scores confirm that both “Reviewing learning programmes and academic activities in line with the FRAMELOG” and “Ensuring readiness for change within the institutions” are considered as essential activities for completing a correct and high-quality process of collaboration among the three actors composing the Knowledge Triangle.

4. Conclusions at national level

From the presented report, both the “FRAMELOG”, composed of indicators, methods and guidelines, and the Guidelines for addressing Quality Assurance, comprehensive of challenges and guidelines on quality, were deeply assessed in the Italian context, with the modalities explained in the Introduction.

From the results, it can be easily reported the overall very positive evaluation that the three involved clusters of key stakeholders gave to each presented output. Some differences on specific aspects can be highlighted in relation to (1) the different profiles of respondents, with the related expectations and core interests, and (2) institutional constraints of educational organizations that seem to obstacle the full implementation of the FRAMELOG collaboration framework, in particular regarding the conjoint definition of HEIs educational contents and programmes with business and research.

Since the open discussion format of the event enable the confrontation between the respondents, the answers given to the open question “Could you please write down 3 topics of Logistics and Supply Chain Management you consider to be most up-to-date when planning the KT?” were the followings:

- Experiential and practical learning methods for students;
- Long-term collaborations among the KT actors, not just focused on short-term projects;
- Focus on innovative inputs from HEIs and Research towards Business for Logistic area improvement.

Appendix 4

National Report for Romania

1. Introduction

This national report presents the results of the research instrument designed by the project members in order to validate the intellectual outputs produced, more precisely the Framework in the Knowledge Triangle in Logistics and the Guidelines for Assessing and Assuring Quality. In this respect, we firstly provide the background for education in Logistics in Romania, clearly presenting the study programmes identified at national level. Secondly, we analyze Romania's Logistics Performance Index, helpful in assessing the need for developing education in Logistics. Thirdly, we process the data collected with the questionnaire especially designed for determining Framelog stakeholders' opinions on the framework in Logistics the project shall at its end deliver, presenting the results representative for Romania.

2. Romanian Education in Logistics

2.1. Education in Logistics

According to tables 1.1 and 1.2. below, in Romania, Logistics represents an attractive field more for in-depth education within Master studies than for Bachelor degrees. Unfortunately, we do not know on what reasons HEIs found and developed the study programmes presented, whether they would like to become more attractive or they do respond to the labour market needs. The online tool created in IO2 of this project should give more details on this issue by asking respondents to motivate the creation of such a study programme within their academic offer.

Bachelor study programme	Field	Language of instruction	Credit points	HEI	Max. no. of students	Qualifications
Industrial Logistics	Industrial engineering	Romanian	240	The Polytechnical University of Bucharest	90	132442 Head of Logistics department 214135 Flow management logistician 132448 Purchase manager
Logistics	Military sciences, information and public order	Romanian	180	Carol I National Defence University of Bucharest	25	211106 Management Controller 242111 Administrator of commercial company 242227 Connection officer for national/European critical infrastructure security

TABLE 1 - BACHELOR STUDY PROGRAMMES IN THE FIELD OF LOGISTICS IN THE ACADEMIC YEAR OF 2018-2019 IN ROMANIAN HIGHER EDUCATION (SOURCE: WWW.ANC.RO)

One thing is certain, **Bachelor degrees in Logistics** are located only in Bucharest and under-represented in Romania where there are only two such programmes: Industrial Logistics within industrial engineering field (addressing 90 students) provided by the Polytechnical University of Bucharest and Logistics within military sciences, information and public order (addressing 25 students) delivered by Carol I National Defence University of Bucharest. Out of the 62.000 places offered in Romania for Bachelor studies, those in the field of Logistics represent 0.00185%.

According to the field of study, the academic curricula HEIs registered in the Romanian National Register of Higher Education Qualifications are presented in the diploma supplement available online:

http://www.anc.edu.ro/rncis_platform/upload/suplimente/146407414963.pdf

http://www.anc.edu.ro/rncis_platform/upload/suplimente/14482852943653.PDF

But, richer opportunities are given to all higher education graduates to study as field for their **Master programme in Logistics**: in Romania, there are 20 Master study programmes in Logistics (presented in Table 1.2), offered both by state-owned and private universities (3 are

organised by private universities and 4 by military HEIs). Moreover, as we can remark, no Bachelor study programme is instructed in a foreign language, whereas there are only 2 Master programmes instructed in English.

Master study programme	Field	Language of instruction	Credit points	HEI	Qualifications that can be practiced on the labour market
Transport Logistics	Transport engineering	Romanian	120	The Polytechnical University of Bucharest	132442 Head of Logistics department 132428 Head of railway station 132443 Head of supply-sale office
Green, smart and integrated transport and logistics		English	120	The Polytechnical University of Bucharest	n/a
Automotive Transportation Logistics	Automotive engineering	Romanian	120	The Technical University of Cluj-Napoca	n/a
Management and Logistics in Transport	Naval engineering and navigation	Romanian	120	Maritime University of Constanta	214135 Flow management logistician
Industrial Logistics	Industrial engineering	Romanian	120	The Polytechnical University of Bucharest	214135 Flow management logistician 214136 Production programmer/launcher 214137 Logistics freight forwarder
		Romanian	120	Lucian Blaga University of Sibiu	132442 Head of Logistics department 214135 Flow management logistician 214137 Logistics freight forwarder
		English	120		

Master study programme	Field	Language of instruction	Credit points	HEI	Qualifications that can be practiced on the labour market
Production and Logistics Management	Engineering and management	Romanian	120	University of Craiova	214137 Logistics freight forwarder 241251 Company expert evaluator 214131 Quality analyst
Logistics Management		Romanian	90	University of Pitesti	n/a
Engineering and Management of Logistics Systems		Romanian	120	Polytechnical University of Timisoara	214135 Flow management logistician 214137 Logistics freight forwarder
Management of Logistics Systems		Romanian	120	University of Craiova	214135 Flow management logistician 214137 Logistics freight forwarder 214953 Inspector/referent in material and fixed assets management
		Romanian	120	Mircea cel Batran Naval Academy of Constanta	242108 Process improvement manager
		Romanian	120	The Technical University of Cluj-Napoca	n/a
International Logistics	Economics and International Business	Romanian	120	Economic Sciences Academy of Bucharest	214135 Flow management logistician

Master study programme	Field	Language of instruction	Credit points	HEI	Qualifications that can be practiced on the labour market
Procurement, Distribution and Logistics	Management	Romanian	120	Alexandru Ioan Cuza University of Iasi	132442 Head of Logistics department 214135 Flow management logistician 333103 Purchase administrator
Management and Logistics		Romanian	120	Constantin Brancoveanu University of Pitesti	242101 Project manager 242104 Process responsible 242110 Specialist in planning, controlling and reporting economic performance
Logistics Management		Romanian	120	Romanian-American University of Bucharest	n/a
	Military science	Romanian	120	Carol I National Defence University of Bucharest	242107 Expert in managing and organising activities 242111 Administrator of commercial company 242202 Expert in public administration
Romanian					
Logistics Operations Marketing and Management	Marketing	Romanian	120	Spiru Haret University of Bucharest	243103 Marketing specialist 243104 Product manager 243102 Organizer of tourism activities

TABLE 2 - MASTER STUDY PROGRAMMES IN THE FIELD OF LOGISTICS IN THE ACADEMIC YEAR OF 2018-2019 IN ROMANIAN HIGHER INSTITUTIONS (SOURCE: [WWW.ANC.RO](http://www.anc.ro))

According to the field of study, the academic curricula HEIs registered in the Romanian National Register of Higher Education Qualifications are presented in the diploma supplement available online:

1. Transport engineering

http://www.anc.edu.ro/rncis_platform/upload/suplimente/151868643083.pdf (Bucharest)

2. Naval engineering and navigation

http://www.anc.edu.ro/rncis_platform/upload/suplimente/14719547151833.pdf (Constanta)

3. Industrial Logistics

http://www.anc.edu.ro/rncis_platform/upload/suplimente/151868414463.pdf (Bucharest)

http://www.anc.edu.ro/rncis_platform/upload/suplimente/14690887032963.pdf (Sibiu)

4. Engineering and management

http://www.anc.edu.ro/rncis_platform/upload/suplimente/14730680511933.pdf (Craiova)

http://www.anc.edu.ro/rncis_platform/upload/suplimente/INGINERIA%20SI%20MANAGEMENTUL%20SISTEMELOR%20LOGISTICE_31102018.pdf (Timisoara)

http://www.anc.edu.ro/rncis_platform/upload/suplimente/14730681271933.pdf (Craiova)

http://www.anc.edu.ro/rncis_platform/upload/suplimente/14464790573733.pdf (Constanta)

5. Economics and international business

http://www.anc.edu.ro/rncis_platform/upload/suplimente/1519145938713.pdf (Bucharest)

6. Management

http://www.anc.edu.ro/rncis_platform/upload/suplimente/14574330362373.pdf (Iasi)

http://www.anc.edu.ro/rncis_platform/upload/suplimente/15124936915073.pdf (Pitesti)

7. Military science

http://www.anc.edu.ro/rncis_platform/upload/suplimente/14482877993653.PDF (Bucharest)

8. Marketing

http://www.anc.edu.ro/rncis_platform/upload/suplimente/14494765915553.pdf (Bucharest)

PHD study programmes in Logistics are organised by PhD schools within HEIs, but we have not found any public document centralising PhD candidates' topics of research so as to identify the presence of Logistics.

To conclude, as Nicolau, Lache and Pisarciuc (2019) highlight, the following issues should be addressed to proper create the Knowledge Triangle in Logistics:

- the Romanian Occupation Code regulate only the following codes: 132442 - Head of Logistics Department (appointed ac-

according to work experience), 214135 - Flow Management Logistician, 214137 - Logistics freight forwarder, 214955 - Logistician in transport, 226308 - Work safety and health coordinator for logistics, 311532 - Technician/Business responsible technician (Logistics methods) and 325726 - Work safety and health coordinator for logistics (the last two are not granted according to higher education degrees). Thus, they seem to be misrepresented and underrepresented. As job markets and job advertisement engines present more job titles and job descriptions in Logistics than those regulated, it is a must to enrich the Romanian Occupational Code with future jobs in Logistics.

- there is an urgent need for European harmonisation of EQF (European Qualifications Framework), Europass and ESCO (European Classification of Skills, Competences, Qualifications and Occupations – based on ISCO-08, International Standard Occupation Classification, and ISCED, International Standard Education Classification, aimed at supporting Europe 2020 strategy and the new European Competences Agenda). The use of these instruments is difficult now and may be confusing when implemented in higher education.

2.2. The Logistics Performance Index for Romania

In this subchapter, we will present the Logistics Performance Index (LPI) that the World Bank publishes every 2 years starting with 2007. According to this index, we shall analyze the current state of Logistics field in Romania (descriptive statistical research) so as to assess the need for developing further education in Logistics. Fig. 1 below clearly shows that Romania's LPI has slightly fluctuated in the period 2007-2018, currently Romania being ranked as the 48th country in the world (ranking shows important changes on the Logistics market). Thus, figures present that the descending ranking shall be addressed with national strategies within which qualitative education in Logistics shall be a general objective.

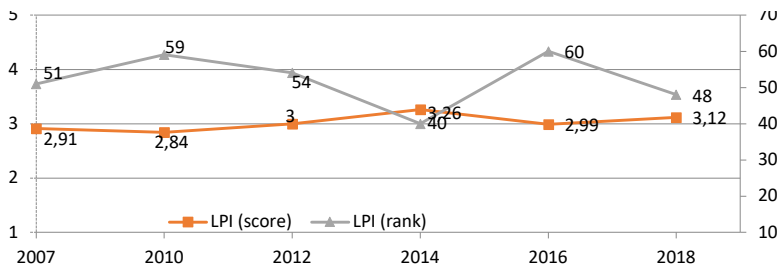


FIG. 1 - ROMANIA'S LPI SCORE AND RANKS IN 2007-2018

SOURCE: WORLD BANK (2018). FULL LPI DATASET: 2007, 2010, 2012, 2014, 2016, 2018. AVAILABLE AT: <[HTTP://LPI.WORLDBANK.ORG/](http://LPI.WORLDBANK.ORG/)> [ACCESSED 12 FEBRUARY 2019]

Moreover, we shall also describe the six indicators taken into account when calculating a country's LPI, presented below:

- The efficiency of customs and border management clearance ("Customs").
- The quality of trade and transport infrastructure (Infrastructure").
- The ease of arranging competitively priced shipments (Ease of arranging shipments").
- The competence and quality of logistics services — trucking, forwarding, and customs brokerage ("Quality of logistics services").
- The ability to track and trace consignments ("Tracking and tracing").
- The frequency with which shipments reach consignees within scheduled or expected delivery times

Thus, Table 2 shows Romania's six LPI indicators within which "Logistics competence" has a high significance in our project as quality of Logistics services is highly influenced by quality of the human resources implied. We underline that this indicator is below Romania's total LPI indicator so the educational market which trains qualified personnel shall be addressed with a proper strategy so as to respond to the national, European and global Logistics markets' needs.

Year	Customs	Infrastructure	International shipments	Logistics competence	Tracking & tracing	Timeliness	Total LPI
2007	2.6	2.73	3.2	2.86	2.86	3.18	2.91
2010	2.36	2.25	3.24	2.68	2.9	3.45	2.84
2012	2.65	2.51	2.99	2.83	3.1	3.82	3
2014	2.83	2.77	3.32	3.2	3.39	4	3.26
2016	3	2.88	3.06	2.82	2.95	3.22	2.99
2018	2.58	2.91	3.18	3.07	3.26	3.68	3.12

TABLE 3 - ROMANIA'S LPI INDICATORS FOR ROMANIA FOR THE PERIOD 2007-2018

SOURCE: WORLD BANK (2018). FULL LPI DATASET: 2007, 2010, 2012, 2014, 2016, 2018. AVAILABLE AT: <[HTTP://LPI.WORLDBANK.ORG/](http://lpi.worldbank.org/)> [ACCESSED 12 FEBRUARY 2019]

With regard to “Logistics competence”, in 2018, Romania is ranked the 47th country by the World Bank out of the 160 countries. This indicator, as shown in Fig. 2 below, surpasses “Infrastructure” and “Customs”, so we underline that these 3 indicators represent the weaknesses of Romania's performance on trade Logistics.

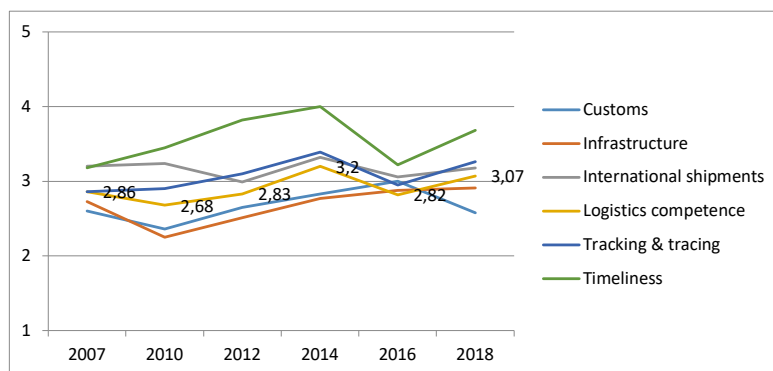


FIG. 2. ROMANIA'S LPI INDICATORS IN 2007-2018

SOURCE: WORLD BANK (2018). FULL LPI DATASET: 2007, 2010, 2012, 2014, 2016, 2018. AVAILABLE AT: <[HTTP://LPI.WORLDBANK.ORG/](http://lpi.worldbank.org/)> [ACCESSED 12 FEBRUARY 2019]

To conclude, when comparing the European ex-communist countries in terms of LPI in 2018, Romania is ranked the 6th country with a LPI of 3.12, following the Czech Republic (LPI=3.68), Poland (LPI=3.54), Hungary (LPI=3.42), Slovenia and Estonia (LPI=3.31 each).

3. Quantitative data analysis: Romanian Stakeholders' Consultations on FRAMELOG and QA Guidelines

3.1. Univariate analysis: Description of the sample population

To the Romanian workshop, there were 37 participants, of which 4 were members of the project team. Out of the 33 participants, 30% represented HEIs (as academic staff and students), 6% research institutions, 6% public authorities and 58% business. These 33 participants received the questionnaire produced in the project especially for the national workshops and we collected 28 answers: 54% of answers were given by business representatives (owners, managers, managing assistants, project managers), 32% by HEIs representatives (academic staff and students), 7% by research institutions representatives and 7% of public authorities.

3.2. Bivariate analysis: Sample population's responses to the questions

We present the results of our research on the Plan-Do-Check-Act cycle on which the questionnaire was designed.

PLANNING

According to the Plan-Do-Check-Act cycle data analysis, Challenges in planning high-quality cooperation (Fig. 3) imply a series of 7 items of which, the most important challenges for our sample were "implementing student-centered learning focused on students' needs" and "planning stakeholders' engagement" (both items scored 4.39 out of maximum 5). This aspect shows that on short term, improvement of relationships among the actors implied in the Knowledge Triangle is needed. The least important challenge is "obtaining course accreditation by public institutions" which, even if in Romania it is a long-term process and a bureaucratic one, it is mandatory for HEIs. Thus, another issue discovered with this project is that HEIs, with their educational offers, are getting closer to the business environment's needs.

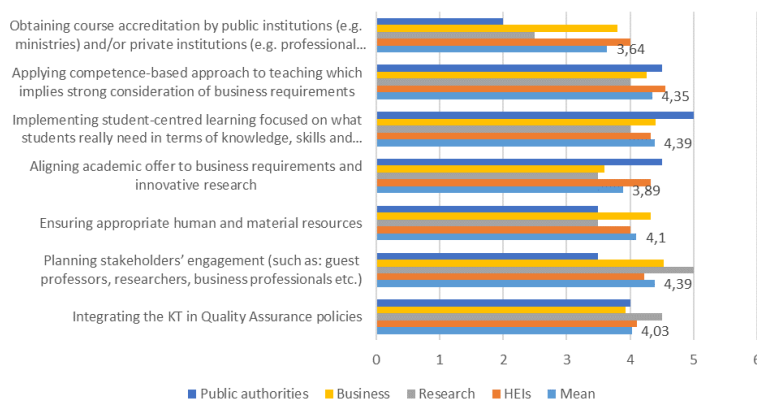


FIG. 3 - CHALLENGES IN PLANNING HIGH-QUALITY COOPERATION

For the above-mentioned challenges, the project identified a number of 9 indicators for assessing the Knowledge Triangle in the planning phase (Fig. 4) which in this research scored all means surpassing 3.5. “The availability of dedicated staff for specific activities” and “selection of educational methods for HEI’s collaboration with business and research” seem to be the most important indicators for our sample, registering means of 4.53, respectively 4.46. We can correlate these 2 indicators with the challenges previously assessed as human resources are the most important within the activities presented as challenges whereas educational methods should be highly centered on students’ needs, skill development and qualifications. Participants’ responses also showed that existence of courses dedicated to Logistics and trained staff are needed.

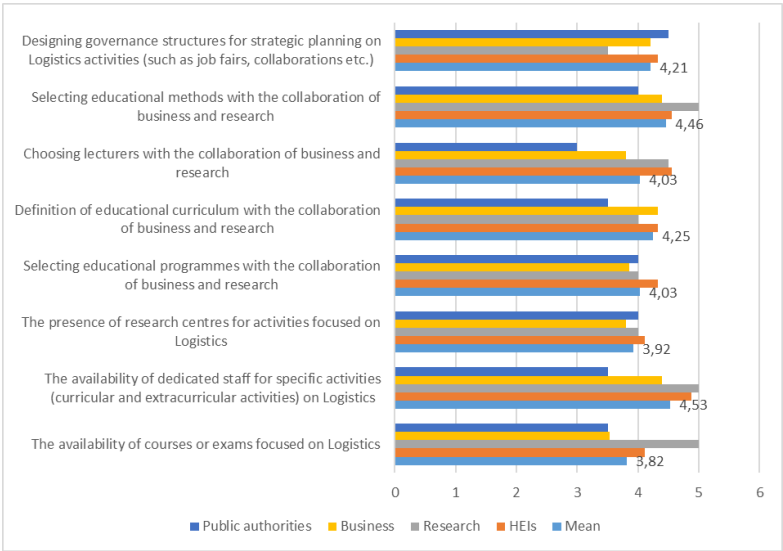


FIG. 4 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN PLANNING PHASE

Next, the research addressed the guidelines that key stakeholders should use in planning the Knowledge Triangle in Logistics (Fig. 5). In this regard, we underline that our sample perceived that all the 18 items are highly helpful in planning for the Knowledge Triangle, but the most important were “defining competence-based education” (mean od 4.6), “checking compliance and conformity of the courses according to regional/national/European” standards”, “embedding industry experts as lecturers” and “selection of educational disciplines, contents and methods in a collaborative framework” (which all got a mean of 4.39). Not oddly, but as a consequence of graphs presented in Figs. 3 and 4, the most important issue in implementing the Challenges is the needed human resources. It results that such a project is necessary as it shows the way its actors may improve their mutual activity in Logistics.

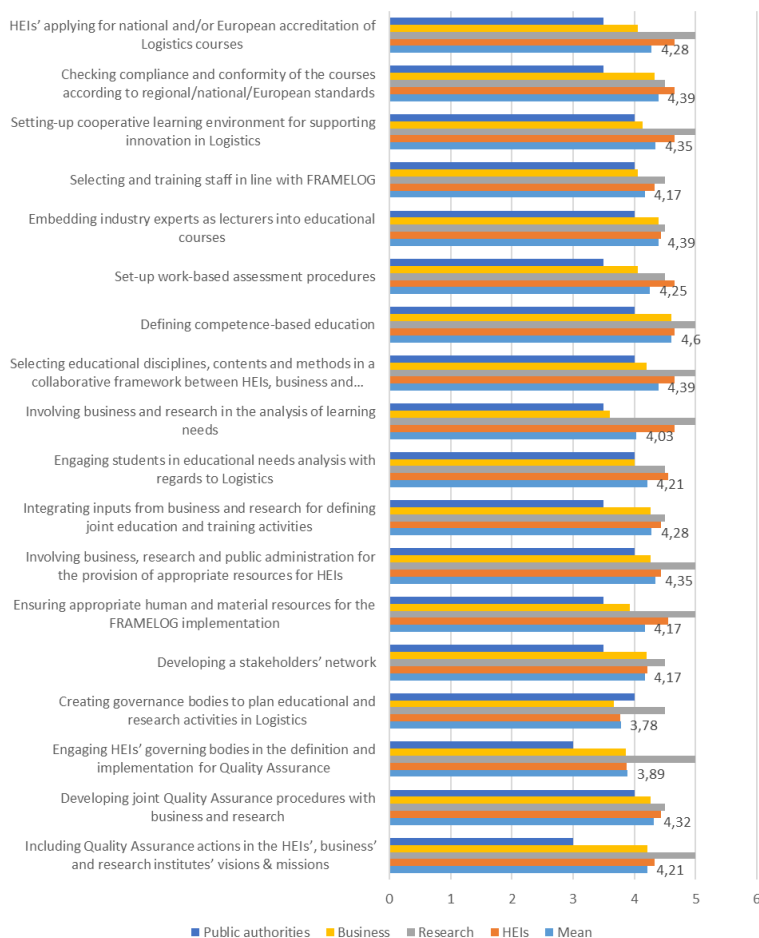


FIG. 5 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN PLANNING PHASE

PERFORMING

Performing high-quality cooperation in the Knowledge Triangle (Fig. 6) consists of 3 challenging items which all scored between 3.5 and 4, in out opinion being an average challenge for the education in Logistics. Thus, we remark that public authorities considered the three items were very important challenges (mean of 4.3) as compared to research institutions that do not give high scores (mean of 2.5).



FIG. 6 - CHALLENGES IN PERFORMING HIGH-QUALITY COOPERATION

Related to the challenges above analysed, the most effective indicators in performing phase of the Knowledge Triangle were, according to our sample, the “availability of temporary or permanent partnership on Logistics” (mean of 4.1) followed by “business professional’s organising visits in HEIs to deliver lectures” and “HEI’s coordination of internships on Logistics together with research and business” (both scored 4.1). Furthermore, the less effective indicator out of the 8 indicators (Fig. 7) designed in the questionnaire was “performing research activities on Logistics topics” which in our view, clearly shows that our respondents are not accustomed to providing education and business solutions with the help of research (topic to be further developed within the project’s sustainability strategy).

Next, our respondents provided us with their opinions with regard to the guidelines needed to perform high-quality education in Logistics (Fig. 8). All the 8 items received average score above 4.00, but the most efficient guideline is “improving internships aligned with education and business needs” (mean of 4.88), followed by two items with identical scores (4.66): “including practical learning activities and work-field ap-

plications in the education delivery methods and tools” and “supporting and facilitation continuous training for teachers and trainers aligned with business”. Thus, we underline the stress put by employability on Romanian education.

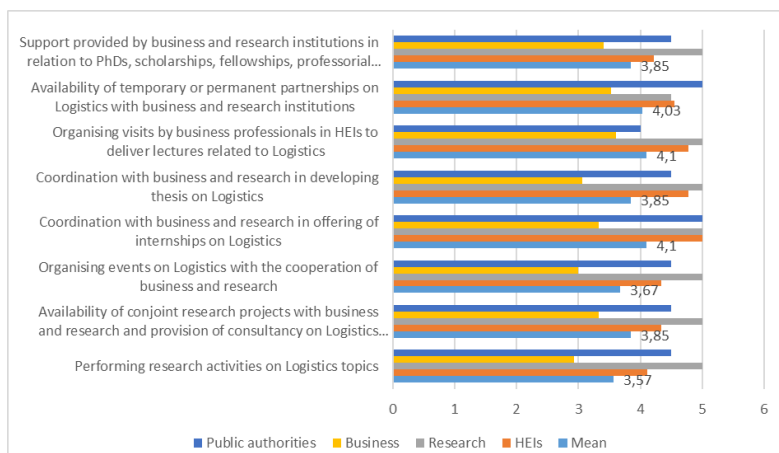


FIG. 7 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN PERFORMING PHASE

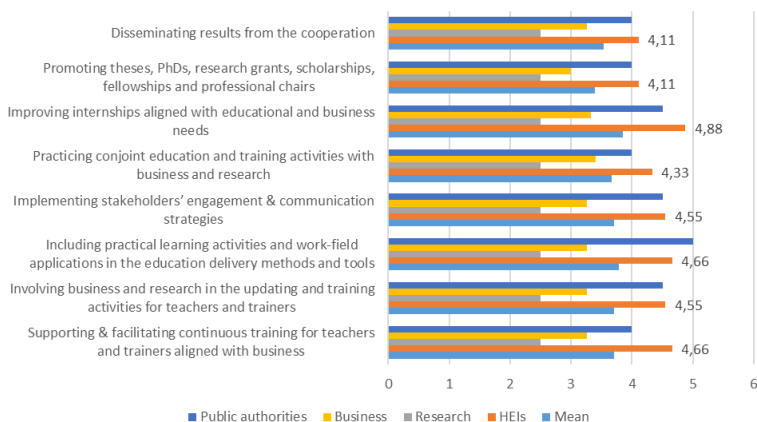


FIG. 8. -GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN PERFORMING PHASE

Form the results presented in Fig. 8, the most significant aspect is the one related to the research's weak implication in education. Hence, the business environment is little interested in cooperating for writing graduation papers or PhD theses as well as in offering funding needed to study Logistics. Practically, we can state that there is no win-win situation for the participants in the Knowledge Triangle. The actions and measures identified within this project may solve such a situation.

Furthermore, the positive aspect identified underlines HEIs' interest in cooperation for organising training activities, internships etc. when training their future graduates as well as their interest in aligning their educational offer to the business environment's needs. After the Romanian national workshop, we consider that this project puts the basis for creating and developing Knowledge Triangles not only in Logistics, but in all the other educational fields.

CHECKING

This phase of the Deming's wheel is firstly undertaken in the project by the challenges in checking cooperation within Logistics education. According to Fig. 9, we highlight that our sample assessed the two items as important, research institutions representatives perceiving them as very important. We consider that this question was too elaborate and its understanding of terminology, even if translated in the mother tongue (Romanian), was difficult.

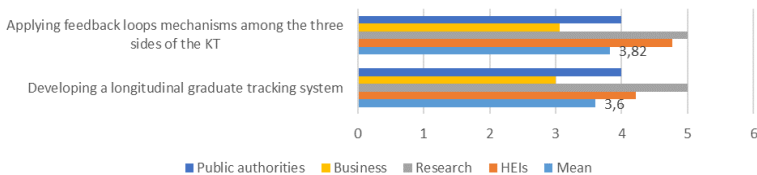


FIG. 9 - CHALLENGES IN CHECKING HIGH-QUALITY COOPERATION

With regard to Framelog indicators, the three ones analysed (Fig. 10) show that "control of the alignment of the Logistics course with external partners at the end of the course" shall be more seriously addressed in

developing the Knowledge Triangle. Even if research institutions gave maximum scores to all the items, businesses consider this phase should be more developed in this project.

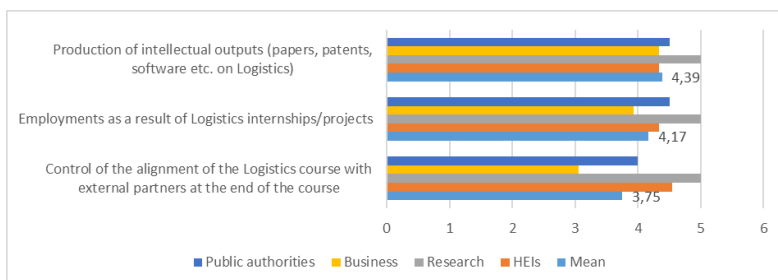


FIG. 10 - EFFECTIVE INDICATORS IN ASSESSING THE QUALITY OF EDUCATION IN LOGISTICS IN CHECKING PHASE

When asked to assess the guidelines for addressing the quality of the knowledge triangle, respondents considered that all the four guidelines are helpful for its development – all items scored above 4.00 as means. We remark that the business representatives are more conservative with regard to the items, as their scores are below the item means.

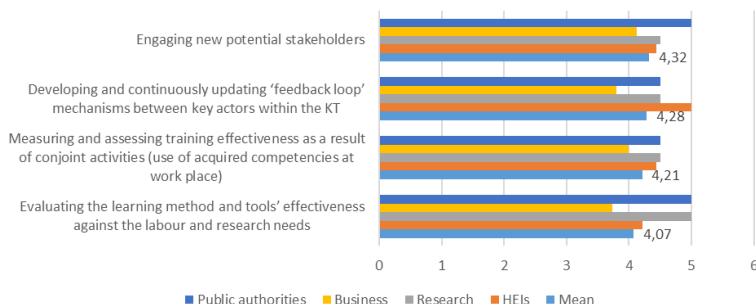


FIG. 11 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN CHECKING PHASE

ACTING

This phase is the most underdeveloped in the project, as in our view, it refers to the Knowledge Triangle in implementation or already developed. Thus, there is only one challenge identified (Fig. 12) which the business sector scored below the mean, so the other actors of the Knowledge Triangle should properly address it.

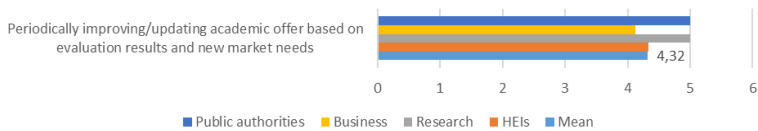


FIG. 12 - CHALLENGES IN ACTING HIGH-QUALITY COOPERATION

As there were no indicators identified in this project (Intellectual Output 2), the two guidelines for addressing quality scored above 4 as means, which shows their importance, as well. Again, the business sector is reluctant to change, any modification it is not welcomed. But surprisingly, public authorities and research are open to change, even more open than HEIs.

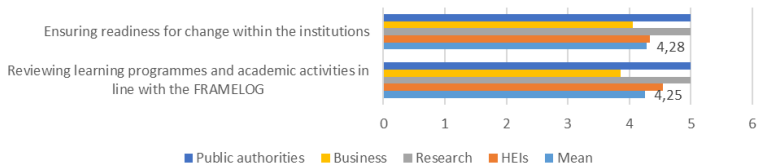


FIG. 13 - GUIDELINES HELPING IN PROVIDING HIGH-QUALITY EDUCATION IN LOGISTICS IN ACTING PHASE

4. Conclusions at national level

The most important results show clearly that there is a difference of perception between the representatives of business and those of HEIs. The majority of items of the questionnaire which received responses from business representatives had scores below the mean of the item, with some exceptions in the planning phase. Fig. 14 clearly shows the scores offered by the Romanian sample for all the phases of the

FRAMELOG. Public institutions are the least prepared for planning the Knowledge Triangle as change management is the most difficult issue to address in Romania. Research institutions and businesses consider the performing phase of the Knowledge Triangle shall be more specifically addressed within the European framework for Knowledge Triangle in Logistics. This is also to be done for the checking phase, according to business representatives' opinions; even if indicators for the acting phase were not produced, the scores received, together with the Compendium of Good Practices (Intellectual Output 1) show the importance of this project.

Moreover, HEIs present their willingness to adapt, more specifically they are open to do the changes needed so as the Knowledge Triangle be successfully implemented. Even if we may assume that they have experience and practice, the business environment shows it is the least open to change the present condition in education. Under such circumstances, the project must hint at undertaking a final document to introduce to the business environment the real issues identified. The lack of some representative national programmes and maybe, of a compendium of Romanian good practice, makes the business field to be reluctant.

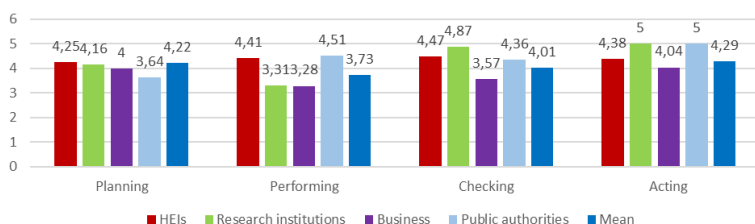


FIG. 14 - OPINIONS OF HEIS' REPRESENTATIVES ON FRAMELOG

With regard to the instrument of research, data collection and organization of the workshop, we underline the following results (Table 4) divided into two categories, positive results and aspects to be further improved in the following validation workshops:

Positive aspects	Areas of improvement
- good organization of the event, participants were interested in the KT, the moderator stimulated participants to talk - the business community has expressed the desire to meet universities for joint projects and the students have shown interest in addressing practical tasks in Logistics - a successful example was presented in which the relationship between university, research and business environment (Mr. Totu) worked well - the Compendium will be especially useful to universities, less business or R & D - participants seriously completed the questionnaire whose length was appropriate - there are significant costs/efforts associated with the necessary changes adapting HEIs to the current market situation which have not been identified - participants insisted on the need to strengthen the links between the three actors of the KT at regional, national and global level by assuming responsibility and recognizing the merits of each, with education being the engine that propels the society forward. - there is availability for using the results of the project	- it was a pity that most of the interpellations were from business / teachers, less from the students (too shy). As far as the attitude towards the KT is concerned, both business and academics tried to assume their supremacy - in the end, they agreed on future cooperation - changing the curriculum for introducing new courses, or especially the flexibility of the offer to students, is a difficult challenge, or rather, with a too long-time horizon (given by the Ministry of Education regulations) - there is no interest in research in the field from business - well-written, but long questionnaire. The too long questions were difficult to be understood - unfortunately, many projects of this type are "one-time shots", outputs are made as required, but there is no continuity; sustainability has deficiencies, for various reasons. - the materials resulting from the project must be arranged so as to facilitate the understanding and adoption of their business- and research-friendly forms. Synthesis is the key word, even if future results of the project cannot be estimated. - HEI focused on partnerships with big companies. For this reason, their approach strategy is not right for SMEs. - there is a system problem that makes any initiative of change in the HEI structure inconvenient - there is no logistics training in Romania and the legal framework (COR) is not adapted to the market requirements in relation to logistics - it seems difficult to decide who makes the connection between all three actors involved and sets the trends of their evolution together.

TABLE 4 - ROMANIAN WORKSHOP CONCLUSIONS

For the final fine tuning of the FRAMELOG and Guidelines, we make the following proposals:

- presenting projects' results in a manner to clearly show the benefits gained as a result of practical implementation of the Knowledge Triangle. The materials produced by now are presented from the project's perspective and under such conditions, are difficult to be understood and used outside it.

- lack of practical methods of cooperation among KT actors determines the business environment to be reluctant with regard to implementing the project's results. For this reason, we propose that a simplified logical scheme should be done so as to implement the recommendations. According to every KT actor's interest, it may enhance its knowledge through deep consultation of the intellectual outputs obtained so far.

- identifying some effective (functional) means at European Union Level to facilitate at least the communication within the Knowledge Triangle. Within our Romanian workshop, we concluded that the constitutive parts of the Knowledge Triangle are largely unknown.

- as the lack of funding of the activities within the Knowledge Triangle was perceived as important in our research, national and EU means for supporting such activities shall be identified.

- starting with our supposition that project partners wish this project to continue (sustainability strategy), we recommend to identify funding for continuing research, poorly represented in the field of education in Logistics until now. This funding could establish a solid base of cooperation among the actors within the KT in the following years.

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www.anc.ro

<http://lpi.worldbank.org/>

Appendix 5

ELA's members validation of the European Framework in Logistics (FRAMELOG)

Executive Summary

1. **Logistics and the Knowledge Triangle:** The **FRAMELOG** project links the Knowledge Triangle of Higher Education, business and research for the systematic analysis and development of logistics learning programmes. A country's economic performance is influenced by its overall logistics performance, which in turn is affected by the quality of its workforce at all levels. With the increasing recognition of the importance of logistics and an acknowledged shortage of skilled logistics personnel, it is clear that a coordinated and collaborative approach to logistics education has to be adopted in order to build the relevant logistics skills and competencies required by employers.
2. **Background to ELA:** The European Logistics Association (ELA) is a partner in the **FRAMELOG** project. ELA held two evaluation events. During the first event participants evaluated the products produced during the project and during the second event participants made recommendations for sustaining and developing the products. Both events were attended by participants drawn from Higher Education, business and research. Data collected during the two events is presented in **Appendix 1** and **Appendix 2** of this report. **Appendix 3** contains further details of ELA.
3. In both ELA evaluation events the participants noted and discussed the differences in the cultures of academia, research and business and that these cultural differences could present particular challenges in setting up and maintaining collaboration between the different stakeholders in the Knowledge Triangle. It was important that each stakeholder understood the perspectives of the others and communicated clearly to enhance collaboration.
4. **Outcomes:** Four outcomes (or products) from **FRAMELOG** were evaluated, namely (I) **The Compendium of Good Prac-**

tice (II) The Guidelines for Addressing Quality Assurance and Assessment Challenges (III) FRAMELOG ICT Assessment Tool and (IV) The Guidelines for Implementation.

5. **The Workshop:** The first event was a half-day workshop with participants from the ELA network who evaluated the relevance and usefulness of the products for their organisations and the other stakeholders in the Knowledge Triangle. The participants came from 13 different countries reflecting ELA's international reach.
6. **The Expert Focus Group:** The second ELA evaluation event was a one-day meeting of an Expert Focus Group. The participants' role was to evaluate the outcomes in greater depth and to suggest ways to sustain the **FRAMELOG** outputs beyond the end of the project. The Expert group were enthusiastic about **FRAMELOG** and its outcomes and felt that "the Knowledge Triangle was a powerful and robust tool when applied in the logistics sector".
7. **Qualitative results:** The Compendium of Good Practice was considered a very useful tool for all stakeholders in the Knowledge Triangle and that it was recommended that it should be maintained in a web based format in the future. The Guidelines for Implementation was seen as a very useful "how to collaborate" tool for the universities to use but that The Guidelines for Quality Assurance were considered to be "surplus to requirements" due to existing QA guidelines at university and national level. **FRAMELOG** ICT Assessment Tool was not seen as useful in its current format but it was felt that it would be useful if it were simplified and developed into a benchmarking tool or developed as a web based self-assessment tool for compliance to the two guideline documents.
8. **Conclusions:** The participants of both groups were very positive and enthusiastic about the outputs produced by **FRAMELOG**. The participants felt that the achievements of **FRAMELOG** had laid the foundation for investing in the maintenance and development of the existing products and also to develop further pro-

jects. A suggestion put forward for the partners to consider, as a potential follow up was to create an Erasmus Joint Masters Degree (EMJMD) in logistics and supply chain management. An EMJMD is an integrated international study programme jointly delivered by a consortium of HEIs and, where relevant, with other partners with specific expertise and interest in the study programme. This suggestion aligns with the objectives of FRAMELOG.



FIG. 1 - THE KNOWLEDGE TRIANGLE

Section One: Logistics and the Knowledge Triangle

Logistics affects nearly every sphere of life, either directly or indirectly. It plays a critical role in planning and managing the flow of goods and services from the basic need for food and water to the delivery of luxury goods and services. Ultimately everything we consume is ‘touched’ by logistics and operating through global supply chains, goods may often have been configured by components, which have come from different parts of the world. As a global profession, it is therefore critically important that the logistics profession is well resourced with highly skilled, competent people.

Logistics is a major growth area in the world economy. An important sector in its own right, it also strongly influences economic performance across all other business sectors. A clear link has been established

between strong economic performance in a country and a high-quality logistics workforce.

It is well known that there is a worldwide shortage of people with logistics skills, knowledge, competencies and behaviours. A recent report commissioned by the World Bank has provided clear evidence of that shortage. The report states that: "... there is empirical support for the frequent claims that logistics and supply chain talent is in short supply. In emerging markets the problem is most acute at the managerial level while in more developed countries it is at the operative level"⁴.

In order to avoid a loss of competitiveness in a global environment, countries with a poorly skilled logistics workforce need to address this deficiency as a matter of priority. With the increasing recognition of the importance of logistics worldwide, it is clear that a coordinated collaborative approach has to be adopted in order to build the relevant skills and competencies needed by the marketplace.

In recognition of the importance of logistics and supply chain management for economic growth, the **FRAMELOG** project links the Knowledge Triangle of higher education, to both research and business for the systematic analysis and development of logistics and supply chain management learning programmes. The intention in this project was to use the Knowledge Triangle to support meeting national and international targets related to the logistics profession, thereby contributing to making countries more competitive.

The objectives of the **FRAMELOG** project were to:

- Support an academic offer in line with the qualification requirements of companies and professional qualification systems
- Improve the cooperation between Higher Education Institutes (HEIs), business and research in the logistics sector in developing qualifications relevant for the labour market
- Enhance the transparency and mutual trust mechanisms for the recognition of professional qualifications

4. <https://openknowledge.worldbank.org/handle/10986/27723>

Logistics Competencies, Skills and Training: A Global Overview

Mckinnon, Alan; Flothmann, Cristoph; Hoberg, Kai; Busch, Cristina 2017.

- Foster the quality and relevance of Higher Education in logistics

As a profession, logistics has suffered from an image problem in comparison with many other disciplines. Ask the average person to describe logistics as a subject and they will often reply, “it’s about trucks and sheds, isn’t it?” This limited view of logistics consisting of transportation and warehousing does not reflect the current strategic importance of logistics and supply chain management within organisations, or indeed the global nature of supply chains in the twenty first century. The image problem is exacerbated by the understanding that transport is viewed as a major contributor to climate change, congestion and greenhouse gas emissions. These negative associations mean that logistics has not been a career of first choice amongst generations of school leavers when selecting their choice of entry into work or into a university programme.

In addition, in many countries, low pay and a low status for logisticians, has made logistics a less attractive career option when compared to subjects like marketing, law, medicine and accountancy which are easy to understand and so easily attract new entrants. The increased use of the term ‘supply chain management’ rather than just the word ‘logistics’ in the title of degree programmes such as ‘logistics and supply chain management’ has helped to establish the subject as a management discipline and therefore more desirable as a qualification. Universities in several European countries have incorporated logistics into engineering programmes both as an evolution of production systems engineering and for similar reasons of enhanced status as described previously

Programmes of vocational education have not always addressed the lack of skilled logisticians at the blue-collar level, though this varies from country to country. This has meant that lower skilled workers have not had the opportunity to gain new skills either.

The participants in ELA’s evaluation of FRAMELOG welcomed using the Knowledge Triangle as the focal framework for sharing knowledge and collaborating across Europe.

Section Two: Background to the ELA evaluation and rational for the approach

The evaluation of the **FRAMELOG** products and the dissemination of the outcomes from the project is the final part of this project. In evaluating the project, the approach of the European Logistics Association (ELA) was of necessity different to the evaluations already carried out in the three countries involved in the project, namely Bulgaria, Italy and Romania. ELA's role was to offer an evaluation from an international business, research and academic perspectives. The added value of the ELA evaluation was that it was carried out in the context of the logistics profession and also across other areas of business involving logistics and supply chain professionals.

The European Logistics Association is a federation of associations. ELA aims to provide an international forum for networking, promotion and development of the logistics and supply chain profession. Its strength lies in its network of individuals and associations. Initially envisaged as a European network, and influenced by the global nature of supply chain management, ELA has developed beyond the confines of Europe to include member associations from the Middle East and Southern Africa. It is now a global federation promoting the European culture with respect to the profession of Logistics and Supply Chain Management.

The membership of ELA consists of twenty seven (27) member associations covering twenty four (24) member countries. It is a network of associations. Some associations in the ELA Network consist of individual members, other associations consist of corporate or organisational members and others have a combination of both individual and corporate members. A few of the associations are 'cluster' associations, which consist of several associations working together. It is therefore not possible to give a total individual membership of ELA. However it is estimated that ELA has an overall reach of approximately 55,000 logistics professionals.

Details of ELA member associations, the countries and populations, together with their Gross Domestic Product (GDP) and the Logistics Performance Indicators (LPI) for each country are listed in Appendix Three of this report.

The World Bank created the Logistics Performance Index (LPI) in order for countries to be able to identify their trade logistics performance in comparison with other countries. This benchmarking tool, produced annually, helps to identify what countries can do to improve their logistics performance.

“The LPI is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics “friendliness” of the countries in which they operate and those with which they trade. They combine in-depth knowledge of the countries in which they operate with informed qualitative assessments of other countries where they trade and experience of global logistics environment. Feedback from operators is supplemented with quantitative data on the performance of key components of the logistics chain in the country of work.”⁵

Based purely on the LPI, ELA member associations include associations from countries with the highest LPI rankings in 2018 such as Germany, Sweden and Belgium. ELA members also include associations from those countries with lower LPI rating such as Morocco, Ukraine and Kazakhstan but which recognise that they need to improve their logistics performance and therefore act along different modern tracks, including leveraging of professional networks.

GDP measures the value of economic activity within a country and represents the monetary value of all the goods and services produced within a country within a defined period of time. It is an indicator of the economic health of a country. The GDP of ELA members’ states amount to 19.361 billion US\$, or 96 % of the GDP of the USA, 112% of EU and 24% of the World GDP. See Appendix 3 for further details.

Previously GDP was used to measure logistics efficiency but this has changed as the cost of logistics has risen along with other costs. A key challenge for logistics professionals is to reduce the cost of logistics as a percentage of GDP. Tackling rising costs has led to more collaboration between retailers, vendors and third party logistics providers. Collabo-

5. <https://lpi.worldbank.org/about>.

ration therefore is a key logistic principle and so the collaboration proposed in the Knowledge Triangle resonated for the logistics professionals invited to the ELA events.

As part of the overall **FRAMELOG** evaluation exercise, ELA hosted two separate events in Brussels, a half-day workshop followed by a one-day focus group of experts. The participants in the workshop were invited to represent the three actors in the Knowledge Triangle, namely academia, the research community and business. The invitations drew heavily on players in the ELA network and on the first day included participants from thirteen different countries.

The aim of the half-day workshop was to familiarise the participants with the Knowledge Triangle, the outputs from **FRAMELOG** in detail and to get their views on the value of the products in enhancing relevance and innovation in logistics education.

For academics, the concept of the Knowledge Triangle is generally known and understood. For the business community, this concept is less well known. The Knowledge Triangle is used by the European Union (EU) in its drive to link more effectively the three drivers of a knowledge-based society. The Knowledge Triangle aims “to foster interaction between education, research and innovation thereby creating the conditions for increased relevance and utilisation of universities’ activities”.⁶

ELA received reports from the three national workshops prior to the ELA events to inform in the planning of the ELA evaluation. In both the ELA events there was discussion of the different perspectives and viewpoints of academia and business. The national reports also highlighted these differences in perspectives. The culture of business and academia was described as being very different and it was noted that this could produce particular challenges in collaboration. For example, initial discussions may have taken place between a university and a business about the joint planning and development of a new programme. However due to the slowness of the university’s internal processes the momentum may have been lost and the potential col-

6. <https://rio.jrc.ec.europa.eu/en/library/knowledge-triangle>.

laborative partnership broken down. The attitude from business was stated as:

“Supply chain is a fast-moving environment. We are used to doing things quickly. Why are you so slow?”

A separate cultural challenge is that the players in the triangle need to ‘speak the same language.’ The language issue in supply chains is complex. Each industry sector (e.g. automotive, life sciences) has its own language or register. Each profession (e.g. marketing, accountancy) has its own register. Developing common definitions and understanding across the different sectors, which they support, given the multidisciplinary and global nature of supply chains, is a very big challenge. Business people can be intimidated by academics and researchers who may use jargon or complex conceptual models, which are unfamiliar to the business community. Researchers may fail to explain their cutting-edge research projects to those very businesses, which might benefit from the research findings because they are unable to explain their findings in a way, which articulates their potential business value.

Section Three: The Workshop

“The value of knowledge depends on what you do with it”- ELA workshop participant 13 March 2019.

The ELA workshop started with a motivational presentation from the Vice President, Human Resource of Atlas Copco about *“How logistics and supply chain graduates make the difference on the labour market”*. The talk covered the challenges currently facing logistics, including disruptive innovation, digitalisation, the importance of collaboration and the individual responsibility of logistics professionals to engage with lifelong learning. The presentation helped to set the scene for the discussions, which followed.

The methodology used in gathering data in the workshop was through a ‘facilitated discussion’ and the use of an interactive on-line tool to gather participants’ views throughout the event. The value of the

interactive tool was that data was gathered automatically and then presented either numerically or as images such as word clouds and charts.

Participants could see their views being reflected on screen as they answered questions. The facilitator could use these 'real time' results to probe deeper into any areas which were ambiguous and required follow up. At the end of the workshop the participants, if they wished, could retrieve and review the results of the questions independently. The same methodology and tool was used the following day in the Expert Focus Group. The numeric results in the appendices are presented as percentages.

The participants in the workshop represented the three sides of the Knowledge Triangle, with 31.25% representing education, 50% representing business and 18.75% from research. The participants started their discussions with a focus on the purpose and value of the Knowledge Triangle. It should be noted that the term 'academia' is used in the Knowledge Triangle but in many academia embraces both education and research.

It was important to establish a common understanding of the Knowledge Triangle before discussing in detail the outputs from the **FRAMELOG** project. It is assumed that the Knowledge Triangle is common terminology in academia and research and perhaps less known in the business community. However this was not the view of the participants. One participant commented that the Knowledge Triangle is not always known and understood even in academia and therefore some time was taken at the beginning of the workshop to understand the value and purpose of the Triangle.

There was a discussion about the 'prism of academia' through which the Knowledge Triangle is currently viewed. Participants felt the current Knowledge Triangle was two dimensional and wished to see an approach which used a three dimensional triangle to see how the information flowed around the triangle and how potentially this could increase the flows of information between the different players.

In response to Question 4 that asked who should initiate collaboration in the Knowledge Triangle, three quarters (75%) of the participants

thought the initiative should come from all three sides of the triangle. It was a joint responsibility and in fact all the participants answered that they had had some experience of collaboration with others.

Whilst all of the participants were aware of some of the challenges of preparing 'work-ready graduates', it was clear that not all of them were aware of the particular challenges and potential barriers which university staff face when introducing new courses, how these challenges can impact both on opportunities for collaboration and on introducing new cutting-edge topics into a degree programme. The Guidelines for Implementation of the Knowledge Triangle identified a common ground for the analysis of the institutions' collaboration. Whilst this tool was appreciated by the group, it was considered to be most appropriate for academic institutions.

In Question 5 the workshop participants were asked to describe the biggest challenges in implementing the Knowledge Triangle. Responses included:

- "Conflicting cultures in business and research centres"
- "Opposing change, especially from Academic boards"
- "Mutual suspicion/lack of trust"
- "Different approaches in timing"
- "Different points of view and priorities"
- (Issues of) "communication"
- "Knowledge gap between companies and universities"

These represented significant challenges to implementation for the different stakeholders in the Knowledge Triangle and some of these challenges were discussed in further detail in the Focus group on the following day. The outputs from **FRAMELOG** were then discussed individually and participants were asked to evaluate which of the tools would be beneficial to their organisation.

The Compendium of Good Practice was seen as a particularly useful tool and would be beneficial for the participants' organisations (31.41%). Participants felt that it had value for all the actors in the Knowledge Triangle. The Compendium is available in two formats, a long and short version. The participants considered that the detailed

version would be valuable to the academic community but that the business community would value the shorter version. However, they would have liked the longer version of the Compendium to be more accessible, by being able to search on key words rather than search through the document to find the different types of case study. A wider variety of examples would also have been welcomed. It was felt that all of the examples related to case studies written from the university perspective and the group would have liked to see more emphasis on *“What was in it for business?”*

Collaborative approaches are frequently used between logistics organisations; for example, to optimise the sharing equipment, vehicles or information etc. in order to reduce costs or to improve performance. Successful collaboration in the supply chain is based on “win win” scenarios where both, or all, partners benefit from the collaboration. According to the workshop participants the case studies appeared to be presented only from the perspective of academia so the ‘win win’ perspective for the other stakeholders was not always apparent. The participants therefore saw a benefit in having case studies of good practice which demonstrated more explicitly the perspective of the two other sides of the triangle, research and business, for example where the initiative for collaboration is taken by business.

Whilst there was the impression that all the initiative for collaboration in all the reported case studies had originated in the universities, this was not the case. In fact some of the initiatives actually originated in companies. The case study reporting on the collaboration between the Novus Trust and the University of Huddersfield is an example of business approaching a university with a proposition to set up a collaborative venture for a learning programme with guaranteed employment for the graduates at the end of the course.

The Guidelines for addressing Quality Assurance and Assessment Challenges within FRAMELOG was considered to be rigorously researched and the challenges clear. However in responding to the question on whether it would be beneficial for their organisation only 19.38% considered it to be useful. Participants suggested that the document (or tool) was likely to be overlooked by HEIs as there were already

extensive quality assurance guidelines in existence. As the document provided a 'step by step approach' to the challenges involved in collaboration, the participants suggested that it could be integrated into The Guidelines for Implementation and presented as one document.

The group thought that the **FRAMELOG ICT Assessment Tool** in its current format had limited application for their organisations (17.83%). The tool is a questionnaire that offers the opportunity for organisations to analyse the structure of their processes for cooperation with other stakeholders in the Knowledge Triangle. It is a self-assessment tool rather than a benchmarking tool. The issue for participants was that the questionnaire took too long to complete, the level of detail required was too high and the questions were not always clear. Although the tool was completed on line, it was not considered 'interactive'. Having completed the questionnaire respondents received a printout of their answers for their consideration and use. The suggestion from participants was to transform it into an interactive benchmarking tool where respondents would be able to assess their organisation's performance anonymously against other organisations. Alternatively use it as a tool for self-assessment of an organisation's compliance to the FRAMELOG Quality Assurance document.

The Guidelines for Implementation of the Knowledge Triangle has been developed in the FRAMELOG project to help organisations improve their level of collaboration. It was considered valuable for use mainly by HEIs with an overall rating by all the participants of 28.29%. It was suggested that an Executive Summary should be added at the front of the document to make it more accessible.

Finally, participants were asked to name three critical topics in logistics and supply chain management. They were as follows:

1. Digitalisation and sustainability were mentioned by the overall majority of the participants
2. Change management, leadership and soft skills followed as distant joint third choices.

Academics designing new programmes should consider inclusion of some of those key business challenges in their programmes.

Section Four: The Expert Focus Group

“The Knowledge Triangle is a powerful and robust tool when applied in the logistics sector and the concept should be widely promoted in Europe and beyond ” – Participant, ELA Focus Group on 14 March 2019

The second ELA event was a one-day Expert Focus group composed of professors of logistics and supply chain, researchers from Higher Education Institutes and senior business executives from the logistics profession. Several of the participants had multiple profiles and covered more than one angle of triangle particularly in the case of education and research.

The role of the Expert Focus group was both to evaluate the FRAMELOG outputs in greater depth and to make recommendations for sustaining the **FRAMELOG** products beyond the end of the project. A major challenge for many EU projects can be to maintain momentum and ensure that the outputs continue to have value and relevance beyond the end of the EU funding. As stated above, the same methodology of facilitated discussion and interactive tool was used during the Focus group to gather the data. This data is presented in Appendix two of this report.

Two case studies of collaboration and best practice were presented by members of the group to help set the scene for discussion. Firstly, Professor Gaby Newman of the Technical University of Applied Sciences, Wildau talked about the collaborative seven semester Logistics degree programme offered at her institution. The course is a practice-orientated degree programme with much of the learning based on case studies, problem solving and project work. There is an academic route into the programme and also a route offered by vocational education. In the seventh semester students work on a bachelor's thesis which is integrated into the workplace. There is collaboration not only with large organisations but also with SMEs (small and medium enterprises). It is often a challenge for universities to collaborate with SMEs due to limited resources. Due in part to the nature of logistics where operators often work with increasingly narrow profit margins, SMEs can focus on short-term strategies and the 'bottom line' rather than on longer term

plans. It is easier for large organisations to collaborate with universities as they have the resources to allocate to this collaboration.

An interesting and innovative approach to engaging with smaller organisations is taken by The Technical University of Applied Sciences, Wildau, which works with SMEs on a regular basis who can come to their logistics courses with 'real life' issues for the students to work on. This offers a 'win win' approach to collaboration for both small and large organisations.

Professor Ed Sweeney of Aston University talked about a number of collaborative initiatives, which are now on offer at Aston University. These include a part time master's degree for those already in work in a logistics function at a managerial level. The programme is delivered at weekends every six weeks and is taught by a combination of academics and guest lecturers from the profession. He also talked about a new route into higher education in the UK through degree apprenticeships which combine paid work and work-based learning with part-time university study. Degree apprenticeship standards are developed by employers, universities and professional bodies working in partnership. Due to a UK government levy on larger employers (based on payroll), the course is funded by employers so this is an increasingly popular route for students and avoids incurring the debt associated with high annual tuition fees charged to students by UK universities on more traditional courses.

In response to Question 1: "What do you know about the Knowledge Triangle?" it was clear that the participants in the Focus group were aware of the Knowledge Triangle, the importance of collaboration in the Knowledge Triangle and its value. The level of collaboration and intention to collaborate was high for academia (46.15 and 43.25%) and business (35.16% and 33.29%) but less so for Research (18.68% and 23.46%).

The participants felt that the Knowledge Triangle was a powerful and robust tool when applied in the logistics sector and therefore the group would like to see its wider adoption and promotion in Europe and beyond. However, in a similar response to the Workshop participants reported above, the experts in the Focus group considered

that the triangle appeared to be viewed only through the prism or perspective of education and research. The group considered that the involvement of business needed to be further developed in this conceptual model of the Knowledge Triangle. The view of the group was that each part of the triangle should be given equal weight. Comments on purpose of the Knowledge Triangle most commonly included the terms:

- “collaboration”
- “innovation”
- Also mentioned, though less often, was:
- “sharing knowledge”
- “industry relevance”
- “research informed learning”

In response to Question 3: “What would you expect from collaboration?” responses included:

- “Having education at the level of latest research”
- “Improving the application of research results in real life approach”
- “A way to adapt relevant programmes to meet the needs of the market”

Overwhelmingly, in response to Question 4 on who should take the lead in collaborating, the group felt that any of the three players could and should take the lead in initiating collaboration (89%). Collaboration was a joint responsibility and should not fall to one part of the triangle alone. In response to Question 5 on ‘how to’ initiate collaboration answers included:

- “By identifying clearly what the value of the initiative is for each partner”
- “Identify the fundamental question and then make sure that someone enters the triangle space to identify potential answers to the question”

Asked to identify the major benefits of the Knowledge Triangle in Question 7, these were overwhelmingly identified as *“Innovation”*, *“Knowledge”* and *“Collaboration”*.

In the late 90s the ELA developed Standards of Competence for Logistics, which focus on what people need to know and be able to do as a competent logistician. They were developed by logistics practitioners and have been updated on a regular basis since their initial development to reflect changes in the profession. These standards of competence have many uses and some of these are described in more detail in Appendix 3 of this document. They provide the basis for ELA qualifications and they are aligned to the levels of the European Framework for Qualifications (EQA) thus qualifications based on these standards are recognised and portable across Europe. Qualifications based on standards of competence are outcomes based and therefore there are no prescribed learning programmes or assessment methodology.

In Question 8, participants were asked if they used these ELA standards and any other standards such as those from CILT (The Chartered Institute of Logistics and Transport), APICS (American Production and Inventory Control Society) and IFPSM (International Federation of Purchasing and Supply Management). These organisations are the internationally recognised bodies for logistics and supply chain management professionals.

In Question 9, participants were asked if they used the above-mentioned standards of competence for accreditation. Each country has its own national body for the accreditation of learning programmes at university level and at secondary and primary level education. In the professions, including logistics, professional bodies offer additional accreditation for university programmes, which is seen as adding value to degree programmes. This additional accreditation is very important for the professions as it provides an independent benchmark of quality and relevance and professional body accreditation is used by universities to market qualifications for potential students researching which programme of study to select. For example, the Chartered Institute of Logistics and Transport (CILT) accredits over 100 programmes in logistics, operations and supply chain management in the UK and beyond.

Since 2017 ELA has also accredited degree programmes. The pre-accreditation assessment tool based on the ELA standards allows universities to pre-assess whether or not a programme will meet their requirements for accreditation. Participants in the Focus group felt that this pre-accreditation assessment tool aligned to the objectives of FRAMELOG and represented ‘added value’ potential for the project.

In assessing the products, the group considered ‘what success in collaboration looked like’ and considered the products in terms of whether the products should be maintained or further developed. Questions 10 and 11 asked participants to assess the outputs from FRAMELOG and which tools should be further developed. The participants then set out the action required for sustaining the **FRAMELOG** outputs.

Recommendations

- 1. The Compendium of Good Practice** of case studies was considered to be a very useful tool providing examples of collaboration. Rather than suggesting any extensive further development, it was recommended that the Compendium would need maintenance in the future adjusting the cases with interested parties putting forward new case studies to be added to the Compendium over time. It was further recommended that these new case studies should be subject to a review process before being added. The new cases would replace existing cases that were no longer current. It was recommended that in the future the Compendium should be web-based so that people could search for examples of good practice just using key words rather than “wading through” the contents list. It was also felt that it would benefit from the inclusion of additional case studies with more diverse examples written from the perspective of the different stakeholders in the Knowledge Triangle. The shorter Compendium of Good Practice case studies was considered more useful than the longer version particularly for business and the format for the short version of the case studies used in The Guidelines for Implementation was preferred.
- 2. The FRAMELOG ICT Assessment Tool** in its current format was not seen as particularly useful. Whilst it identified relevant

buidling blocks in collaboration projects, participants thought that it took too long to complete and would benefit from a reduction in the number of questions and a simplification of the language used in the questions. As it was a self-assessment tool the level of detail that the respondent had currently to complete was excessive and unnecessary. It was recommended that the questions be reviewed for clarity of language and to reduce the level of detail required when completing the questionnaire. Participants had been expecting that the Assessment tool would be a benchmarking tool and were disappointed that there was no opportunity to compare one organisation with another. The tool did not therefore provide a benchmark for improvement. It was recommended that if it were to become an interactive web-based tool, it would act as a valuable self-assessment tool for compliance to the **FRAMELOG** Quality Guidelines and The Guidelines for Implementation. It was also suggested that tool should ultimately be developed into a full benchmarking tool.

3. **The Guidelines for Implementation** was seen as a very useful 'how to' tool for those in universities looking for a step-by-step guide for 'how to' initiate and improve levels of collaboration. The Guidelines included a set of indicators and clear suggested actions but that it would be useful mainly for HEIs rather than for the other two sides of the Knowledge Triangle. As reported in the introduction to this report, the shortage of logistics skills is at all levels and not just at the senior levels of the profession. It was therefor recommended that the Guidelines for Implementation should be extended to include Technical Schools as it appeared to be currently focused on the more traditional courses of undergraduate and masters degrees. Participants felt that the document was very detailed and quite long and therefore it was recommended that the document would benefit from an Executive Summary at the start of the document to make it more accessible for those using it.
4. **The Guidelines for addressing Quality Assurance and Assessment Challenges** was seen as comprehensive and well researched

but that it was essentially “surplus to requirements”. It was assessed as useful by only 19.63% of the participants. Those from academia stated that it would be in competition with existing guidelines for Quality Assurance to which all university programmes are subject and also to the national quality guidelines for Higher Education. Therefore the document would be likely to be ignored by the senior staff. As stated above the tool was not without merit, so participants recommended that key aspects of this document should be incorporated into the Guidelines for Implementation.

Section Five: Conclusions

The three national reports and the participants in the ELA organised event highlighted the challenges presented by the fact that there are different perceptions of the three actors in the Knowledge Triangle. There is clearly work to be done on building a clearer understanding of each other’s challenges and in the clarity of communication between the different players in the Knowledge Triangle.

In planning for the sustainability of the project’s outputs, the group focused first on short-term maintenance and then on the longer-term perspective of commitment and investment of resources.

A summary of the recommendations from both ELA events:

- Set up a system for maintaining the currency of The Compendium of Good Practice; ensure that new cases are added after a peer review process and out of date cases removed; add more case from the perspective of business and research; make the tool web based
- In the short term simplify The ICT Self-Assessment tool by reviewing the questions and removing requirements for unnecessary detail; in the long term develop this tool into a benchmarking tool for collaboration
- For the Guidelines for Implementation it is recommended that in the short term an Executive summary should be added to make the information easy to access; in the long term the Guidelines should be reviewed to ensure that the perspectives of all sides of the Triangle are considered

- It was recommended that The Challenges and Guidelines for Quality Assurance should be integrated into the Guidelines for Implementation.

In the long term, the participants were enthusiastic about the outputs produced by **FRAMELOG** and felt that in the future there was potential for a further project, FRAMELOG Mark Two. The participants in the Focus Group would welcome more meetings joining together stakeholders from the three sides of the triangle in logistics to build on **FRAMELOG** and its products.

There are achievements from **FRAMELOG** to build on, with the foundations being laid within this project. For example there is the potential to build an Erasmus Joint Masters Degree (EMJMD) between the existing partners or by introducing new partners. EMJMD is “an integrated international study programme jointly delivered by an international consortium of HEIs and where relevant with other partners with specific expertise and interest in the study programme”.

A key aim of EMJMD is to improve the level of competencies and skills of Masters graduates and their employability and thus could provide an excellent follow up to the **FRAMELOG** project.

Finally, the challenge for the **FRAMELOG** partners will be to maintain this current initiative once the project finishes. The partners will of necessity move onto other projects and activities. It was suggested by the participants in the Expert Focus group that the ELA, as a network of logistics associations and individual logistics professionals, should look at providing such a platform for sustaining **FRAMELOG**.

Annex I
The European Framework for Knowledge Triangle or the FRAMELOG
LEGEND

Column 2: Actors: A: HEIs (High Education Institutions); B: Research institutions, C: Companies

Column 9 - Guideline reference: specific guidelines have been developed for high-impact methods. Codexis from full “Guidelines” document (available of the FRAMELOG website). For the other methods/actions specific guidelines have not been provided (*) or it has been inserted the reference to Compendium of Good Practices (Section 1), FRAMELOG Assessment tool (Section 2.3), Stakeholder Engagement Plan (Section 2.3).

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
I) Presence of courses or exams on Logistics	A	1 - PLAN	1.1 - Educational offer	Lack of educational offer specific on Logistics	No courses	Development of specific courses or at several levels (Bachelor, Master, professional) focused on Logistics, based on the needs and potentialities of the entity	Analysis of specific needs of the territory in terms of Logistics courses/exam and analysis of the potentialities of creation of courses/exams. Proposal of courses focused on Logistics during official meetings for the periodical (usually annual or biennial) course planning. Proposal to local/ national key players on Logistics (e.g. Port/ Airport Authorities) or Trade Associations of co-financing of courses on Logistics. Creation of a “Strategic Committee” comprised of the above-mentioned figures, with consultative powers.	A1. “Starting the process: initiate the SWOT analysis and identify the basic organizational structures”
					Some courses (just Bachelor or Master or professionals)	Development of specific courses or exams at the missing level	Proposal of courses focused on Logistics during official meetings for the periodical (annual...) course planning.	A1. “Starting the process: initiate the SWOT analysis and identify the basic organizational structures”
					Yes, all levels	Analysis of the contents and educational methods used	See sub topic 1.3	A2. “Selecting educational disciplines, contents and methods”

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
II) Presence of dedicated staff for collaboration on didactic activities on logistic topics	A, B, C		1.2 -Structure	Lack of dedicated structure	No	Identification of a reference person in the most suitable administrative office who will be in charge to take care of active collaborations with external partners about didactic activities on logistic topics	Analysis of the staff chart and selection of a unit and a position where the role/responsibility for didactic activities in the logistic field can be assigned. The diplomacy and organizational competence will be considered as fundamental requirements.	(*)
					Yes	Analysis of the existing staff and of their functions	Analysis of the most efficient profile in terms of management of collaboration with external partners from good practices and self-assessment .	Compendium of Good Practices – FRAMELOG Self-assessment tool
III) Presence of Research centers on Logistics	A, B, C				No	Evaluation of the opportunity to create a research center (1) or the activation of a collaboration with an existing one (2)	1. Start of the process of creation of a Research Center : search of possible Partners for financial and scientific support with a proposal of governance and activities inspired to the best practices. 1.1. Proposal to local/ national key players on Logistics (e.g. Port/Airport Authorities) or Trade Associations of co-financing of the research center on Logistics. 2. Activation of collaborations : Search of possible Partners for activating a first a temporary collaboration, with the perspective of an enduring one.	A1. "Starting the process: initiate the SWOT analysis and identify the basic organizational structures"

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
					Yes	Analysis of the activities offered/ planned in the Center – analysis of the organizational structure – analysis of the active collaborations	Using the Good practices , analyse the alignment of the activities of the Center in terms of innovation, effectiveness, diffusion of the results. Assessment of the governance: the Center should be participated by different actors to reach completeness. Evaluation of active collaborations: consider the profile of Partners and the ones presented in the best practice to evaluate an enlargement. Evaluation of active collaborations: consider the profile of Partners and the ones presented in the best practice to evaluate an enlargement.	Compendium of Good Practices
IV) Presence of external contacts for selecting educational contents	A		1.3 - Collaboration in Designing Courses	Contents/ Methods not aligned with company's needs	No	Plan to include experts from the industry, Research institutes and (when absent) lecturers of different fields (e.g. Engineering, Economy, Informatic, Law) in the meetings in which the courses are designed	In respect of the national standards required, selection of contents using: - topics considered essential by the industry; - the last innovative results achieved by ad-hoc research institutions. The Good practice will also help in guiding the balance of the different needs.	A2. "Selecting educational disciplines, contents and methods"
					Yes	Review of the contents (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of contents based on the best practices' ones and (2) starting the accreditation process for the course with the alignment of the required elements.	A4. "Accrediting courses: the key process"

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
V) Presence of external contacts for defining educational programmes	A				No	Plan to include experts from the industry, Research institutes and (when absent) lecturers of different fields (e.g. Engineering, Economy, Informatic, Law) in the meetings in which the programmes are designed	At the official meetings of Didactic Councils, proposal of participation of experts from the Logistics area and researchers to debate about the proposed programme of courses/exams on Logistics. Guidelines to lecturers to guide the definition of programmes: contents needed are mostly the currently required topics from Companies, the last trends and findings of Research centers and the LogiComp, the “competences tracking tool” that identified the most important competences related to the Logistic field.	A2. “Selecting educational disciplines, contents and methods”
					Yes	Review of the programmes (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of programmes based on the best practices’ ones and (2) starting the accreditation process for the course with the alignment of the required elements.	A4. “Accrediting courses: the key process” – Compendium of Good Practices

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
VI) Presence of external contacts for choosing lecturers	A				No	Plan to include experts from the industry, researchers from Research institutes and lecturers of different fields (e.g. Engineering, Economy, Informatic, Law) as lecturers	Lectures should be mixed as presented: - Internal and guest professors (national/ international); - Guest experts from Business (national/ international); - Partners/ Alumni (in research/ business topics).	A3. "Embedding industry experts as teachers and/or lecturers into educational courses"
					Yes	Review of the selected lecturers (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of the selected lectures based on the best practices' ones and (2) starting the accreditation process for the course with the alignment of the required elements.	A4. "Accrediting courses the key process" – Compendium of Good Practices
VII) Presence of external contacts for selecting educational methods	A				No	Plan to include experts from the industry, researchers from Research institutes and lecturers of different fields (e.g. Engineering, Economy, Informatic, Law) in the meetings in which the methods are selected	The most efficient methods, to be used, from the analysed good practices for methods are the following: - Innovative teaching methods: case studies, projects, industry specific software experiencing, simulations, interactive games; - Intensive Alumni interactions.	A2. "Selecting educational disciplines, contents and methods"
					Yes	Review of the methods (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of methods based on the best practices' ones and (2) starting the accreditation process for the course with the alignment of the required elements.	A4. "Accrediting courses the key process" – Compendium of Good Practices

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
VIII) Presence of external contacts for the governance on Logistics	A, B, C		1.4 - Collaboration in The Governance	Lack of contacts with other stakeholder for relevant decision about the core activity	No	Inclusion of business experts and researchers in the governance body	Creation of ad-hoc Strategic Committee with key players on Logistics to advise and consult about opportunities of collaborations, courses, exams. In respect of the institution structure, the powers assigned to the Committee could be different.	A1. “Starting the process: initiate the SWOT analysis and identify the basic organizational Structures”
					Yes	Check of the structure adopted (see above)	Check of the structure adopted (see above)	(*)
IX) Presence of research activities/ topics in Logistics	A, B, C		1.5 - Innovation	Lack of use of innovative topics/ results/ trends	No	Develop of research activities on Logistics	Prevision of development of research projects on Logistics inside the course, using a compendium of last research achievements and trends in parallel to the course contents.	(*)
					Yes	Check of the methods (see above)	Check of the instruments (see above).	(*)

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
X) Presence of conjoint research projects, consultancies on Logistics	A, B, C	2 - DO	2.1 -Conjoint Activities	Lack of activities carried out with other stakeholders	No	Develop of conjoint activities with business and research entities, such as: - Research projects with students - Production of intellectual outputs (papers, articles, patents) - Seminars	- Guidelines for development of Research projects with students/ Production of intellectual outputs (papers, articles): selection of companies for the development of specific projects on Logistics based on their field of activity and/or selection of Research Institutions; contract with the chosen Partner and selection of graduates/ students to assign to the project; tutoring and review of the production from academic lecturers; dissemination of results. - Guidelines for development of seminars: selection of business and/or research representative for specific seminars on Logistic topics presented during courses and innovative trends in the market; event management (finding of budget, selection of possible dates/ venues/ duration, booking and marketing).	B5. "Developing conjoint activities with business and research entities"
					Yes	Check of the activities carried out (see above)	Assessment of the effectiveness of the activities carried out in terms of diffusion of contents, employment of students, innovation reached. Consider extending and/or selecting activities.	B5. "Developing conjoint activities with business and research entities"

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
XI) Presence of events on Logistics	A, B, C		2.2 - Dissemination Activities	Lack of dissemination activity	No	Organization of events to disseminate results on Logistics, from both internal and external projects	Guidelines for selection of business and/or research representative for specific seminars on Logistic topics presented during courses and innovative trends in the market; event management (finding of budget, selection of possible dates/ venues/ duration, booking and marketing).	B8. "Disseminating results"
					Yes	Check of the activities carried out (see above)	Assess of the effectiveness of the activities carried out in terms of diffusion of contents, number and kind of participants, frequency. Consider extending and/or selecting activities.	B8. "Disseminating results"

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
XII) Presence of coordination, offer of internships on Logistics	A, C		2.3 - Internship	Lack of connection between education institutions and workplace in terms of internship	No	Coordination and/or offer of internships focused on Logistics	- Guidelines for Coordination: involvement of external Partners (from business/research), promotion towards students of the possibility of internships on Logistics topics at the Partner's premises, administrative arrangements, providing of tutoring before/during/after internship, monitoring of results of the activity (employment, intellectual outputs). - Guidelines for Offer: promotion towards students of the possibility of internships on Logistics topics in the HEI's facilities (Research centres, e.g.), administrative arrangements, providing of tutoring before/during/after internship, monitoring of results of the activity (employment, intellectual outputs).	B6. "Improving offer of internships and stage"
					Yes	Check of the internships organized (see above)	Assess of the effectiveness of the activities carried out in terms of intellectual output produces, employment/ collaborations developed.	B6. "Improving offer of internships and stage"

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
XIII) Presence of coordination, offer of thesis developed on Logistics	A, B, C		2.4 - Thesis	Lack of connection between education institutions and workplace in terms of production	No	Coordination and/or offer of Thesis focused on Logistics	- Guidelines for collaboration: involvement of external Partners (from business/research), promotion towards students of the possibility of thesis on Logistics topics with the selected Partners, administrative arrangements, providing of tutoring, monitoring of results of the activity (innovative contents, effectiveness of solutions proposed). - Guidelines for Offer: promotion towards students of the possibility of thesis on Logistics topics, administrative arrangements, providing of tutoring before/during thesis, monitoring of results of the activity (innovative contents, effectiveness of solutions proposed).	B6. "Improving offer of internships and stage"
					Yes	Check the quality of thesis developed by the HEI's graduates	Assess the quality of the already developed thesis in term of: - innovation of contents (in case of research thesis); - effectiveness of solutions proposed (if developed with /for a company). Consider orienting the future thesis on the most innovative trends on Logistics and to the development of innovative solutions for companies.	(*)

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
XIV) Presence of visits organized into facilities related to Logistics topics	A, B, C		2.5 – Visit	Lack of physical connection between education institutions and workplace	No	Development of periodic visits to companies and research centres for analysing Logistics facilities/ equipment/ software	Guidelines for collaboration: involvement of external Partners (from business/research), promotion towards students of the possibility of visits for analysing Logistics facilities/ equipment/ software; administrative arrangements; event management (finding of budget, selection of possible dates, logistics); dissemination activity of the event.	FRAMELOG Stakeholder Engagement Plan
					Yes	Check of the quality of visits organized	Assess of the effectiveness of the visits carried out in terms of number of participants, frequency, spin-offs (development of thesis, collaborations, internships). Consider extending and/or selecting visits.	(*)

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
XV) Presence of temporary and/or permanent partnerships on Logistics	A, B, C		2.6 - Partnership	Lack of collaborations on Logistics	No	Develop temporary and permanent collaborations on Logistics	Guidelines for collaboration: selection of external Partners (from business/research), proposal of projects to be developed together to give value to the collaboration, discussion on the expected results of collaboration, administrative management. Consider developing: - temporary collaboration as first step; - permanent collaboration after the good outcome of the first one or with already known Partners.	C10. Engagement of new potential stakeholders + FRAMELOG Stakeholder Engagement plan
					Yes, but only temporary or permanent	Check of the quality of Partners with active collaborations on Logistics and consider developing new ones	See above for the development of the missing one/s.	C10. Engagement of new potential stakeholders + FRAMELOG Stakeholder Engagement plan
					Yes	Check of the quality of Partners with active collaborations on Logistics	Assess of the effectiveness of the active collaborations carried out in terms of number of projects, frequency, spin-offs (development of thesis, internships, student employments). Consider extending and/or selecting collaborations.	C10. Engagement of new potential stakeholders + FRAMELOG Stakeholder Engagement plan

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
XVI) Presence of PhDs, bourses, fellowships, professorial chairs on Logistics topics	A, B, C		2.7 - Funding	Lack of sponsorships, funding on Logistics topics	No	Develop a framework of sponsorships and funding for Logistics area	Consider developing the following sponsorships, to enhance the collaboration of the Triangle: - PhD; - Bourses; - Fellowships; - Professional chairs.	B7. "Promoting thesis, PhDs, research grants, fellowships and professional chairs"
					Yes, but only some kind of sponsorship/funding	Check of the quality of actual sponsorships and funding on Logistics and consider developing new ones	See above for the development of the missing one/s.	B7. "Promoting thesis, PhDs, research grants, fellowships and professional chairs"
					Yes, all of them	Check of the quality of actual sponsorships and funding on Logistics	Assess of the effectiveness of the active sponsorships and funding in terms of number of students reached, frequency, spin-offs (development of thesis, internships, student employments). Consider extending and/or selecting collaborations.	(*)

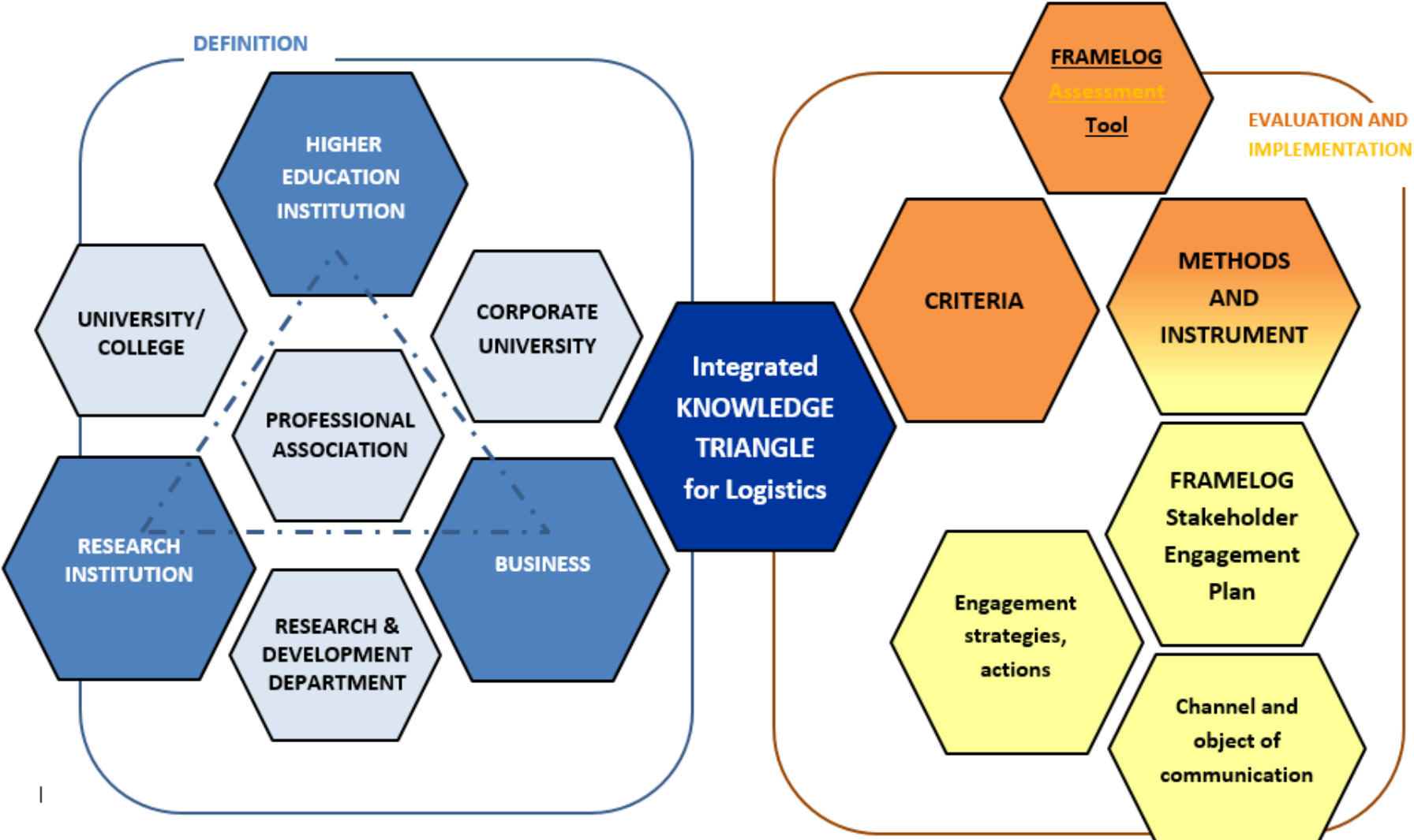
1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
XVII) Presence of controls on the alignment of the set of courses requirements with external partners on Logistics, at the end of the course	A	3 - CHECK	3.1 - Check of educational requirements	Lack off effective collaboration between education and companies in terms of controls of educational requirements	No	Develop of controls on the alignment of course results respectful of the initial requirements with the co-presence of experts from business and research	Implement a double check of initial requirements and final results of the course/exam about: - Course/exam contents, in terms of completeness and research material; - Educational method used, in terms of effectiveness; - Programmes developed, in terms of workload and usefulness. Consider developing a survey for students about the evaluation of the previously mentioned aspects.	(*)
					Yes	Review of the selected controls (1), evaluation of alignment of programmes and requirements of the accreditation process (2)	If the collaboration is already active, consider (1) the review of the controls activated based on the best practices' ones and (2) starting the accreditation process for the course with the alignment of the required elements.	(*)

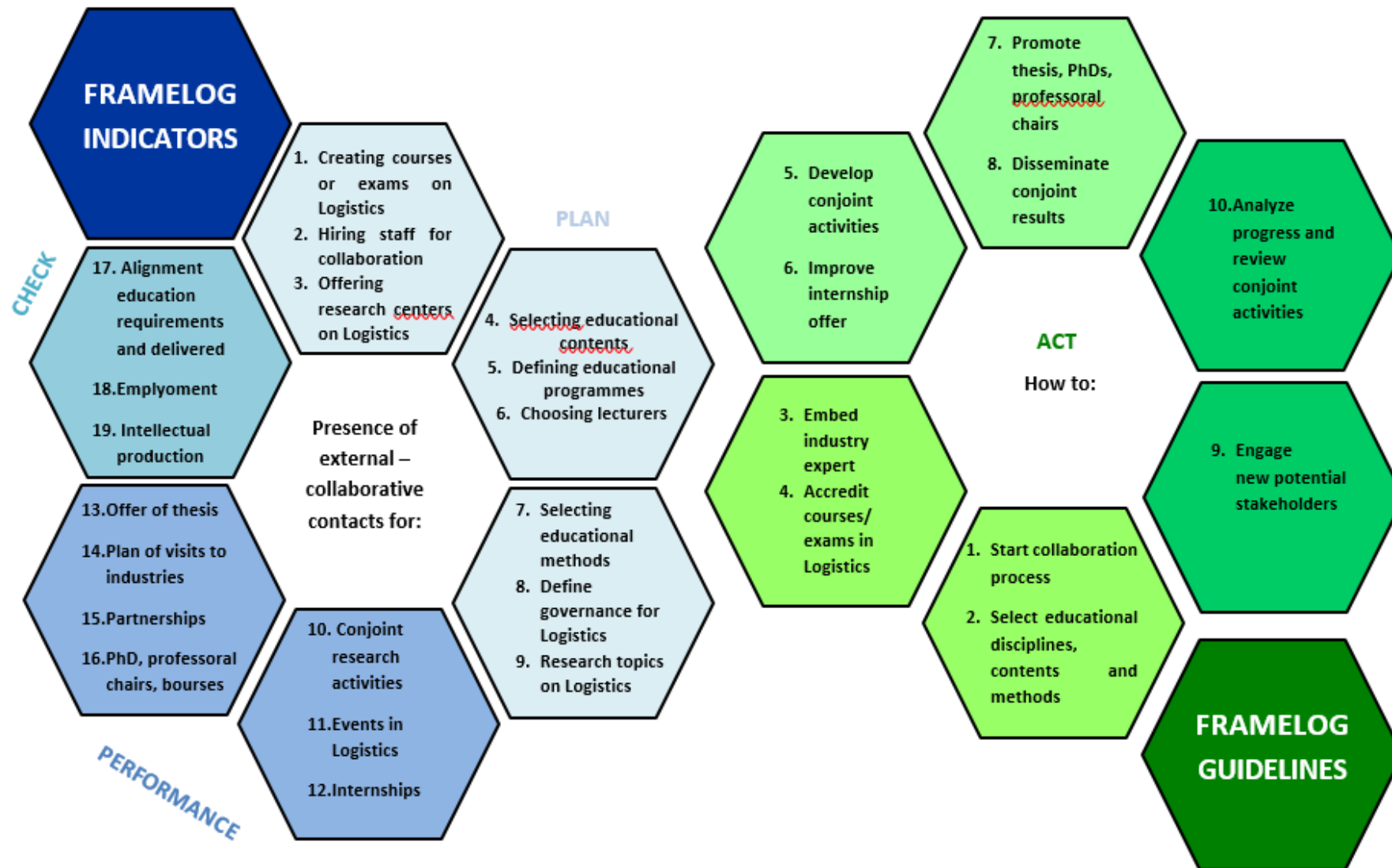
1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
XVIII) Presence of employments consequent to internships/projects on Logistics	A, B, C		3.2 - Employment	Lack of effective collaboration between education and companies in terms of employment	No	Promote employment to Companies in the Logistics areas	Develop of a framework of activities which will enable a higher number of internships in the Logistics areas, using the Compendium of Good practices . Here some examples: - Agreement with Companies for developing dual programs (university courses with elements of professional training or work experience) and sandwich courses (educational course integrated with period of work); - Developing internships schemes in which employment is guaranteed (e.g. Budapest Metropolitan University scheme or the NOVUS scheme in Huddersfield); - Creation a virtual job search platform specialized in logistics positions; - Organizing job fairs with Companies.	Compendium of Good Practices
					Yes	(1) Check the percentage of employment up to the total number and (2) consider some strategies to increase it	(1) Check the effectiveness of the activities activated, (2) consider increasing activities (see above).	

1	2	3	4	5	6	7	8	9
Indicator	Actor involved	Phase of activity flow (PDCA)	Sub Topic (area inside the phase)	Risk covered	Assessment tool possible result	Methods	Instruments and possible actions to be used/implemented	Guideline reference
XIX) Presence of production of intellectual outputs: papers, patents, software etc. on Logistics	A, B		3.3 - Production	Lack of intellectual outputs on Logistics	No	Promote collaboration to Companies and Research Institutions in the Logistics areas with the scope of developing intellectual outputs	Develop of a framework of activities which will enable an opportunity of co-development of intellectual outputs in the Logistics areas: - Agreement with Companies and Research Centers for developing research project/ thesis/ PhDs projects oriented to the creation of software/ drafting of papers; - Creation a virtual research platform specialized in collect proposals of articles, papers; - Organizing job fairs with Companies and Research Centers to stimulate the cooperation.	C9. "Measuring effectiveness of conjoint activities"
					Yes	(1) Check of the production coming from the active collaborations and (2) consider some strategies to increase it	(1) Check the effectiveness of the active collaborations and production, (2) consider increasing activities (see above).	C9. "Measuring effectiveness of conjoint activities"

Annex 2

Visual representation of The European Framework for Knowledge Triangle or the FRAMELOG





The FRAMELOG project (acronym for “European framework for “Knowledge Triangle” in the Logistic sector”) was created to study and encourage the cooperation among three organizational macro-categories composing the so called “Knowledge Triangle”, specifically private companies, research centers, and high education institutions. The field of application is an area that is constantly becoming more and more strategic for both companies and national economies: Logistics. The investigation, thanks also to the international perspective adopted, is meant to have a three-fold contribution: first, it proposes a deeper understanding of the necessary changes that academic and other educational institutions are called to implement to meet the needs of the Logistics companies; secondly, it provides some potential solutions to boost the creation of collaborative attitudes among Knowledge Triangle key actors in Logistics; finally, the study enriches the growing academic debate about the role of collaboration and of competences development in the turbulent environment of the Logistics.

Authors and contributors

Università di Pisa (Italy)

Giannini Marco, Niccolini Federico, Scipioni Sara, Gaiotto Beatrice

Italian logistics association (Italy)

Bisogni Paolo

Bulgarian Logistics Association (Bulgaria)

Rakovska Miroslava, Stratieva Styliana

The European Logistics Association (Belgium)

Carvalho Dorothea, Geerkens Nicole

Finance & Banking, Associazione per lo Sviluppo Organizzativo e delle Risorse Umane (Italy)

Cotovanu Ana Maria, D'Acunto Federica, Spatafora Mario

University Of National And World Economy (Bulgaria)

Kabakchieva Dorina, Stefanova Kamelia

Universitatea Transilvania Din Brasov (Romania)

Foris Tiberiu, Marinescu Nicolae, Nicolau Cristina, Pisarciuc Cristian, Poțincu Cristian, Poțincu Laura