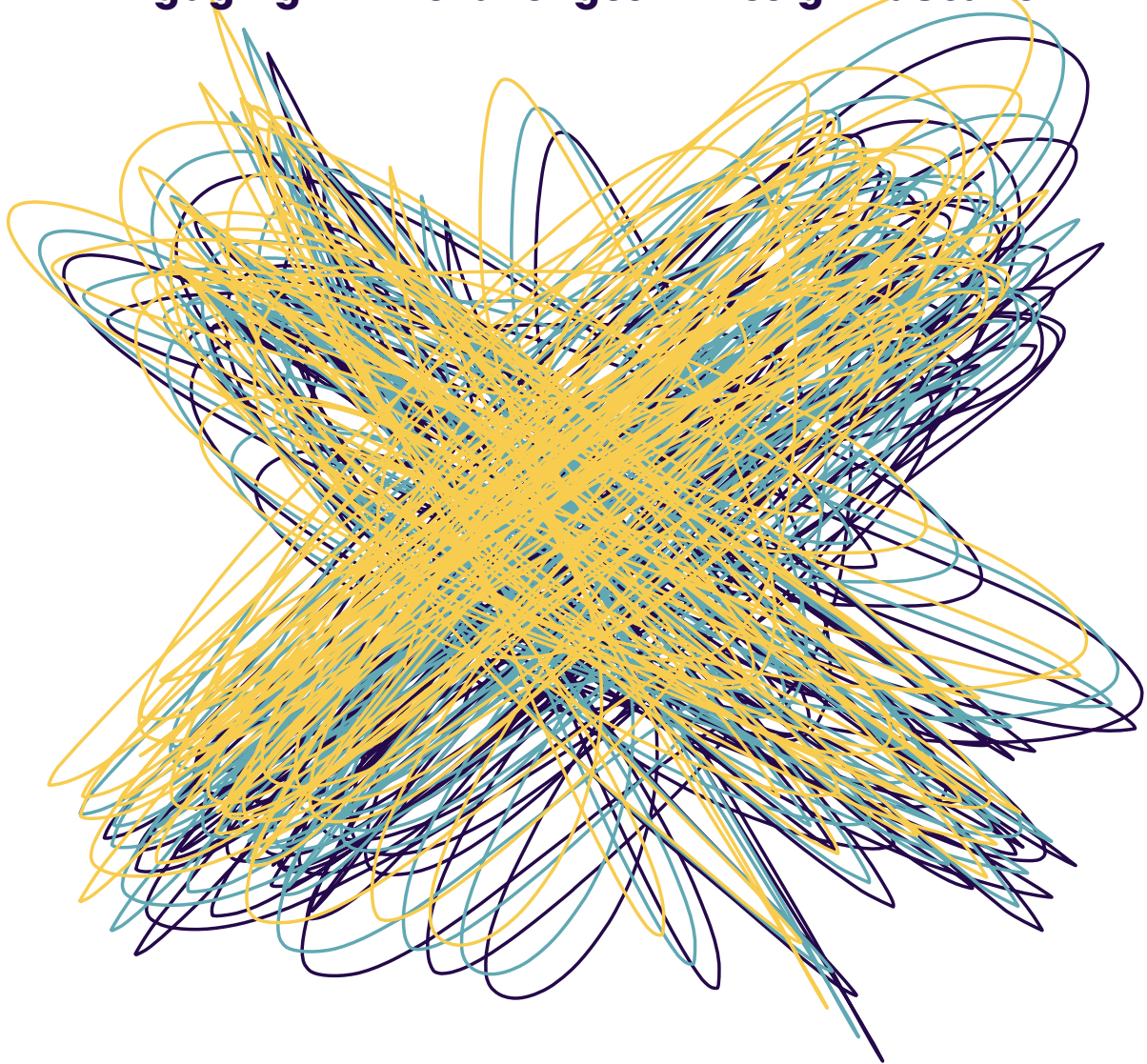


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PROCEEDINGS

DRS LEARNxDESIGN 2021

Engaging with Challenges in Design Education



**6th International Conference
for Design Education Researchers**

24–26 September 2021
Jinan | China

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in the Year
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6th International Conference for Design Education Researchers
Engaging with Challenges in Design Education

10th Anniversary of the International Conference for Design Education Researchers
国际设计教育学者大会10周年

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Table of Content

Volume 1 | 卷1

10 th Anniversary of the International Conference for Design Education Researchers.....	1
Lusheng Pan	
Jinan 2021: Engaging with Challenges in Design Education	3
Erik Bohemia, Liv Merete Nielsen, Naz A.G.Z. Börekçi and Yang Zhang	
Ankara 2019 – Insider Knowledge	30
Naz A.G.Z. Börekçi, Fatma Korkut and Dalsu Özgen Koçyıldırım	
London 2017 – The Allure of the Digital and Beyond	35
Derek Jones	
Chicago 2015 – Education and Design to Enlighten a Citizenry.....	38
Robin VandeZande	
Oslo 2013 – Design Learning for Tomorrow	45
Liv Merete Nielsen	
Paris 2011 – Researching Design Education	50
Erik Bohemia	
Section 01	
Track 01: Design Thinking to Improve Creative Problem solving	59
Úrsula Bravo, Catalina Cortés, Jeannette LaFors, Fabio Andres Tellez and Natalia Allende	
End Users in Students’ Participatory Design Process	68
Noora Bosch, Tellervo Härkki and Pirita Seitamaa-Hakkarainen	
Integrating Design Thinking into STEAM Education	78
Xuejiao Yin, Shumeng Hou and Qingxuan Chen	
Inclusive education driven by design.....	91
Úrsula Bravo and Maritza Rivera	
Measuring the Impact of Integrating Human-Centered Design in Existing Higher Education Courses.....	100
Saadeddine Shehab and Carol Guo	
Research on the performance evaluation and preference of design thinking methods in interdisciplinary online course	111
Juan Li, Shuo-fang Li , Meng-xun Ho and Zhe Li	
I Can and I Will.....	123
Zhengping Liow	
Nordic Life Design.....	138
Kirsten Bonde Sørensen	
Different Ideas, Lots of Ideas.....	152
Jody Nyboer and Brad Hokinson	
Assessment of Ideation Effectiveness in Design Thinking	167
Farzaneh Eftekhari, Mohammad Jahanbakht and Farnoosh Sharbafi	
Study on the Implementation of the Innovative Enterprise Product Design Model for ID Students.....	184
Shuo-fang Liu, Jui-Feng Chang and Chang-Tzuoh Wu	
A New Design Thinking Model Based on Bloom’s Taxonomy	196
Fan Wu, Yang-Cheng Lin and Peng Lu	
FIDS for Kids: Empowering Children through Design	212
Ruthie Sobel Luttenberg and Natalia Allende	
Workshop: How to Design to Improve Life	216
Catalina Cortés and Mariano Alesandro	
Section 02	
Track 02: Empowering Critical Design Literacy.....	222
Eva Lutnæs, Karen Brønne, Siri Homlong, Hanna Hofverberg, Ingvill Gjerdrum Maus, Laila Belinda Fauske, and Janne Beate Reitan	

Experiencing Sustainable Fashion: Have Fun and Feel Clever	226
Hanna Hofverberg and Ninitha Maivorsdotter	
Framing students' reflective interactions based on photos	232
Marije ten Brink, Frank Nack and Ben Schouten	
Critical design literacy through reflection in design	245
Ingvill Gjerdrum Maus	
Encountering development in social design education.....	255
Lesley-Ann Noel	
Exploring practices of critical design literacy.....	264
Eva Lutnæs	

Volume 2 | 卷2

Section 03

Track 03: Alternative problem framing in design education	277
Lesley-Ann Noel, Renata Marques Leitão, Hannah Korsmeyer, Sucharita Beniwal and Woodrow W. Winchester III	
Play Probes	280
Line Gad Christiansen and Sune Klok Gudiksen	
Environmental Education in Protected Areas in Petrópolis	294
Marianne Von Lachmann, Rita Maria de Souza Couto and Roberta Portas	
Reframing Ageing in Design Education.....	307
Emma Gieben-Gamal	
Tilting to Transform	315
Noemi Sadowska and Tara Hanrahan	
Beyond Problem-Solving	318
Allison Edwards and Hannah Korsmeyer	

Section 04

Track 04: Collaboration in Design Education	322
Naz A.G.Z. Börekçi, Fatma Korkut and Gülay Hasdoğan	
Collaboration with NPOs in Industrial Design Education.....	327
Zeynep Yalman-Yıldırım and Gülay Hasdoğan	
Towards Radical Synergy for More Just & Equitable Futures.....	338
Audrey G. Bennett, Ron B. Eglash, Roland Graf, Deepa Butoliya , Keesa V. Johnson, Jenn Low and Andréia Rocha	
Transitioning From University to Work in Service Design	358
Daniela de Sainz-Molestina and Andrea Taverna	
Educational Programs in Between Design and Supply Chain	369
Gabriele Goretti and Gianni Denaro	
Collaboration Practices in Industrial Design Education	380
Naz A.G.Z. Börekçi, Gülay Hasdoğan and Fatma Korkut	
Reflections on Shared Mood Boards	395
Anniliina Omwami, Henna Lahti and Pirita Seitamaa-Hakkarainen	
Preparing to Introduce Design Thinking in Middle Schools.....	405
Michael Gibson, Keith Owens, Peter Hyland and Christina Donaldson	
Socially-Engaged Distance Design Collaboration.....	414
Kardelen Aysel and Can Güvenir	
Improving Intercultural Collaboration with Visual Thinking.....	424
Kelly M. Murdoch-Kitt and Denielle J. Emans	
It's the Cultural Difference That Makes the Difference.....	432
Clive Hilton, Muxing Gao and Rong Wei	
Cross-Cultural UX Pedagogy: A China-US Partnership.....	439
Ziqing Li, Colin M. Gray, Austin L. Toombs, Kevin McDonald, Lukas Marinovic and Wei Liu	

Process Based Collaborations.....	451
Rebekah Radtke, Hannah Dewhirst, Joe Brewer and Ingrid Schmidt	
Advisory Committee Structures of Chinese Design Schools.....	459
Fan Chen, Lin Li and Jing-Yi Yang	

Section 05

Track 05: Co-creation of Interdisciplinary Design Educations	476
Arild Berg, Camilla Groth, Fausto Medola and Kate Sellen	
Learning Design, Co-Designing Learning	479
Stefano Perna and Pietro Nunziante	
Siloed in Breaking Silos	489
JiaYing Chew	
Design for Justice Lab	499
Santiago De Francisco Vela, Laura Guzman-Abello and Santiago Pardo Rodríguez	
Challenges in Multidisciplinary Student Collaboration.....	516
Melis Örnekoğlu-Selçuk, Marina Emmanouil and Jan Detand	
Systemic Design Education in Interdisciplinary Environments.....	529
Asja Aulisio, Amina Pereno, Fabiana Rovera and Silvia Barbero	
Interdisciplinary Boundary Experiences	540
Laura Ferrarello and Catherine Dormor	
Using Creative Practice in Interdisciplinary Education	553
Bilge Merve Aktaş and Camilla Groth	
Co-Creating a Cross-Material Silk and Porcelain	567
Anne Solberg and Ellen Baskår	
Construction of Curriculum System of Design Education.....	581
Han Shi, Feng Xue, Jing Pei, Yijing Li, Zhihang Song, Chunli Ma and Shangshang Yang	
Essential Medications	592
Kate Sellen, Nav Persaud, Stuart Werle, Mariam Al Bess, Nick Goso, Ruslan Hetu, Habiba Soliman, Alyssa Bernado and Norm Umali	
Card-Based Learning Objective Design.....	598
Stefano Perna and Moritz Philip Recke	

Volume 3 | 卷 3

Section 06

Track 06: Learning Though Materiality and Making.....	604
Juha Hartvik, Mia Porko-Hudd and Ingvild Digranes	
Thinking with Card.....	607
Benjamin Hughes	
Imaginary Museums	613
Ke Jiang and Benjamin Hughes	

Section 07

Track 07: Sketching & Drawing Education and Knowledge	626
Bryan F. Howell, Jan Willem Hoftijzer, Mauricio Novoa Muñoz, Mark Sypesteyn and Rik de Reuver	
Sketchnoting Experience of First-Year Students	631
Verena Paepcke-Hjeltness, Annaka Ketterer, Ella Kannegiesser, Madeline Keough, Victoria Meeks and Ayla Schiller	
Online Comprehensive Teaching on Digital Hand-drawing.....	647
Ming Zhu	
Exploring the Experiential Reading Differences between Visual and Written Research Papers.....	660
Bryan F. Howell, Asa R. Jackson, Henry Lee, Julienne DeVita and Rebekah Rawlings	
Visualizing Your Knowledge and Connecting the Dots	676
Verena Paepcke-Hjeltness	

New Immersive Workflows for Design and Production	679
Mauricio Novoa Muñoz, Wendy Zhang, Jose Manuel Rodriguez Diaz, Bryan F. Howell and Jan Willem Hoftijzer	
Section 08	
Track 08: Design Learning Environments	687
Katja Thoring, Nicole Lotz and Linda Keane	
Unlocking Wellbeing-Affordances in Elementary Schools.....	689
Ruth Stevens, Ann Petermans and Jan Vanrie	
Architecture for Education	703
Anne P. Taylor	
Senseed: A Multisensory Learning Environment.....	718
Ge Fu	
A Game Implementation Approach for Design Education	737
Duhan Ölmez and Fehmi Doğan	
Architectural Design Studio as an 'Extended Problem Space'.....	746
F. Zeynep Ata and Fehmi Doğan	
Immersive Learning	756
Yuan Liu, Dina Riccò and Daniela Anna Calabi	
Teaching with Virtual Simulation: Is It Helpful?	772
Meng Yue Ding, Yi Ke Hu, Zhi Hao Kang and Yi Jia Feng	
Materiality of Space and Time in the Virtual Design Studio.....	780
Ruth M. Neubauer and Christoph H. Wecht	
Designing Criteria for Developing Educational Multimedia Games	789
Chaitanya Solanki and Deepak John Mathew	
The Intellectual Diet in Pastoral Spaces of Activity in Digital Design Education.....	800
Andreas Ken Lanig	
Rethinking Experiential Learning in Design Education	807
Alessandro Campanella, Eliana Ferrulli and Silvia Barbero	
Utilising Collaborative Online International Learning	816
Adela Glyn-Davies and Clive Hilton	
Hybrid Spaces Teaching for “Chinese Traditional Costume Craft”	823
Shunhua Luo, Jingrui Yang and Chunhong Fan	
Critique Assemblages in Response to Emergency Hybrid Studio Pedagogy.....	830
Christopher Wolford, Yue Zhao, Shantanu Kashyap and Colin M. Gray	
The Leftovers of Participation	844
Andrea Wilkinson and Steven Lenaers	
Students and Teachers Becoming Co-Designers of Learning	848
Gloria Gomez and Rodney Tamblyn	
Volume 4 卷4	
Section 09	
Track 09: Futures of Design Education	856
Yashar Kardar, Lilyana Yazirlioğlu, Ayşegül Özçelik and Sarper Seydioglu	
Ten Scenarios for the Future of Design Education	859
Lore Brosens, Johanna Renny Octavia Annelies Raes and Marina Emmanouil	
Doing Research in Design	868
Sandra Dittenberger, Stefan Moritsch, Agnes Raschauer and Julia Pintsuk-Christof	
Learning Remotely Through Diversity and Social Awareness.....	879
Ferrarello Laura, Fiadeiro Rute, Hall Ashley, Galdon Fernando, Anderson Paul, Grinyer Clive, Stevens John and Lee Chang Hee	
From Eyes to Ears	900
Daniela Hensel, Birgit Bauer and Stefanie Voß	

Social Implementation of Design Workshops Output	910
Yanfang Zhang, Christian Cruz, Shinichiro Ito and Tokushu Inamura	
Section 10	
Track 10: Design Educators as Change Agents	920
Xiang Xia, Yang Zhang and Ziyuan Wang	
Teaching for Values in Design.....	923
Elisabet M. Nilsson and Anne-Marie Hansen	
Design Educators: Change Agents in RE-Designing Education	931
Robin Vande Zande	
Framing Research Assistants’ Pedagogical Roles in Design Studio Courses: Initial Findings.....	934
Koray Gelmez, Pelin Efilti, Enver Tatlısu, Tuğçe Ecem Tüfek and Onur Yılmaz	
Transformative Teaching Practice Through a Design Thinking Approach in Social Settings	948
Janey Deng Klingelfuss and Markus Klingelfuss	
Reform of Product Design Teaching	960
Meng-Dar Shieh, Hsu-Chan Hsiao and Yu-Ting Hsiao	
Inquiry Practice Design Teaching in Application-Oriented University.....	976
Jianpeng Zheng	
Learning Patterns in Architectural Design Studios	987
Julie Milovanovic	
Professionalization of the Discipline of Interior Architecture	996
Katelijjn Quartier	
On the Signature Pedagogy of Photography Courses.....	1003
Yuanyuan XU	
Problems in the Reform of Design Teaching and Solutions.....	1012
Lei Sun	
What Have You Learned?	1028
Selen Sariel	
Research on the Green Design Course in Industrial Design	1038
Lu-Ting Xia, Chun-Heng Ho and Xing-Min Lin	
Cultivate Leadership Contagion	1044
Francesco Galli, Zhabiz Shafieyoun and Gerry Derksen	
Mash Maker: Improvisation for Student Studios	1055
Ryan Slone and Bree McMahon	
Research on China’s Industrial Design Education.....	1061
Yun Fan, Jianglong Yu, Yang Zhang and Erik Bohemia	
Teaching Workshop: Universal Design for Learning.....	1072
Hsiao-Yun Chu	
Author Index.....	1077

Educational Programs in Between Design and Supply Chain

Significant Examples of Academia-SMEs Joint Labs in Italy

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Locate: Furniture manufacturing in Italy is based on interconnected small and medium-sized enterprises based on craftsmanship know-how. Focus: These companies have undertaken profound transformations within the production chain in a logic of *advanced craftsmanship*, integrating enabling technologies into high-quality craftsmanship processes. This transformation is aiming at shaping *intelligent enterprises* and it requires new design professionals able to work with systemic view, connecting design competencies to an overview on the supply chain issues. Report: In this context, academia-industry joint programs could train design managers able to understand, acquire and integrate the tangible and intangible values of manufacturing culture and technological innovations. The research reports on joint labs cases studies in between Academia and SMEs that aimed at defining innovative design paths based on digitalization of production and production management. Argue: The presented experiences highlight on how the overall training systems provided by the university could represent a significant booster within the entire digitization process and innovation management. In fact, the laboratories have been involved within specific production steps of the companies.

Keywords: advanced craftsmanship; supply chain; design education; joint lab programs; digitalization

Italian Manufacturing Districts of Furniture and Home Details. Socio-Economic Transformations Underway

The organization of furniture manufacturing districts in Italy is based on an articulated differentiation of productions that involves highly specialized independent small and medium-sized enterprises. Each of them focuses on a single activity or on a series of small and consequential tasks that define a specific phase of the process. This *collaborative* structure is known as *Industrial District*, a cluster of manufacturers that allows to cover the entire manufacturing process of the artifact thanks to the territorial proximity between the companies.

Proximity among these players facilitates a direct interaction in between them, setting a production model able to transfer the cultural aspects of the territory and *"Made in Italy"* intangible values into a product with strong and significant aesthetics (Morace & Lanzone, 2010). This relational attitude in between companies is widespread in many Italian regions, in particular in production areas characterized by manufacturing contracting and sub-contracting models. This "relational" link among SMEs is also allowing to virtuously manage the financial aspects to start the production and acquisition of raw materials, as well as time and operational phases.

The complex management of districts issues and the effects of the COVID-19 health crisis have partly affected this organizational model which, although still valid for its relational aspects, today can only be effective by widening the boundaries of innovation as much as possible. By involving new experts and technological aspects apparently far from the specific production process (Di Lucchio, 2005) it is possible to boost a regeneration of this company cluster and to develop new competitive advantages.

In fact, advanced digital equipment could help SMEs that present management skills in facing emerging market



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challenges. Moreover, through a design-driven digital innovation it is possible to strengthen the link in between product and territory. In fact, digitalization allows to design “*the traceability of products within trans-territorial supply chains, making the manufacturing framework transparent about the different production steps and processes up to the final marketing stage*” (Rullani, 2016).

This new scenario forces Design Research to rethink a brand-new system that preserves the positive relational aspects of the district - emphasizing them through the digitization of the supply chain and optimizing times and phases - and that develops a g-local approach, on one hand promoting the intrinsic social, cultural and territorial aspects of the product system and on the other hand opening up localized manufacturing clusters to new global opportunities and connections.

Advanced Craftmanship: Ongoing Trends in Made in Italy Supply Chain Bridging Manufacturing Traditions and Innovation Processes

This industrial district models often refer to values and production techniques proper of traditional craftmanship. The strategic communication in between visionary designers and open-minded craftsmen stands as a *pillar* within history of Italian Design, in fact many Italian design masterpieces have been developed within this strategic synergy (De Fusco, 2009).

Craftmanship implies *knowing how to do things* and includes the arts of making, the ability to produce, the knowledge of materials and transformation processes. When the craftsman know-how meets rising contemporary innovation, incorporating brand new technics and processes into tangible and intangible values of artisanship, in this case we talk about *advanced craftmanship*. This new perspective on craft bridges the concept of *quality driven know-how* to contemporary innovation, making technologies facilitating the processes and supporting the values of a good productions. Then, digital equipment could strengthen the production intrinsic values without reducing or *damaging* the exquisite craft mastery (Goretti, 2017).

This scenario presents rising trends and case studies underway. Within these transformations, it is possible to highlight significant implementations and new supply chain practices (Fry et al., 2016) that could be categorised as follows:

- Technological transfers and cross fertilization:

The transfer of technology from a manufacturing area to other one, by saving the previously experienced expertise and reinterpreting this innovation know-how within the new production sector. Technology transfers have represented a strategic factor in market repositioning for many production chains in recent decades - an emblematic case is the transfer of laser cutting from the automotive system to fashion (Fry et al., 2016). In addition, some exchanges and transfers of knowledge between different production areas could establishing totally new supply chain networks that go beyond the traditional manufacturing categories.

- New technologies and supply chain logistics:

Consistent advancements in innovation of supply chain logistics aims at improving production planning, time-to-market. In addition, research on logistics could develop new strategies in raw materials procurements and suppliers' management, artefact certification systems and traceability methods. Furthermore, Industry 4.0 program -as part of Horizon EU framework- offers innovation paths that represent a strategic tool to furtherly systematize the ongoing updating processes.

Developments of Advanced Product Design and Design Management Competencies for SMEs Supply Chain

Digitalization process of production companies doesn't stand as a new subject and some significant transformations became more than fifteen years ago. Anyway, limitations and measures today imposed to deal with COVID-19 prompted the companies to introduce new technological supports and improving the digital transitions already started in the past years.

The transition from the Third to the Fourth Industrial Revolution was in fact characterized by an even greater interaction in between man and machine within the SMEs production and in between the different players involved in the design process connected to the companies.

During the second half of twentieth century, the state-of-the-art of technologies highlighted on the emerging need to create and manage production processes able to generate knowledge (Di Lucchio, 2005); however, recent emerging issues within the SMEs supply chain in different market areas require new business models aiming at redesign the traditional systems of production, consumption, transport and shipment (Schwab, 2016).

Then, the new scenario of Italian manufacturing districts requires the creation of a widespread management

system that makes emerging enabling technologies -part of *Industry 4.0* model, promoted and supported by national Government and European Commission- as a tool for enhancing and evolve the best practices and values of "*Made in Italy*" supply chains. These strategic implementations generate updated business model based on optimization of resources, integrated management and communication of tangible and intangible values of advanced craftsmanship to the final customer. In practice, the new achievements of SMEs clusters aim at accomplishing the *intelligent enterprise* as defined by Acts: "*Integrated Digital management of technical processes, as production and management of the traditional company through the implementation of enabling technologies of Industry 4.0*" (Atti, 2018).

Therefore, the new districts of "*Made in Italy*" don't focus only on good design, artefact quality and control of traditional processes, but also on the integrated logistics management of different manufacturing paths of the cluster. Then, the traditional role of the design and product manager is not enough anymore. We highlight on an emerging request of new design managers able to face the Industry 4.0 technologies and to become the centric point of reference of the *intelligent enterprise*.

Anyway, considering the national Italian overview, only few districts and production processes have completely developed a digital integrate transition and Italian scenario looks quite fragmented. Even if these limited case studies could represent a significant strength, the weight of these companies is not suck as to lead a real transformation at national level.

The main reason why of this structural weakness is due to the lack of access for SMEs to the up-to-date research outcomes on advanced implementation of enabling technologies and supply-chain management – as product lifecycle management (PLM)- or lack of competencies in setting feasible planning for the implementation. This gap occurs despite the fact that we can detect an already existing knowledge in the companies about some digital technologies, although they are used in a limited way to specific processes and not in an interconnected framework. Examples are the use of cloud systems, CNC machines, laser cutting and 3D printing for the development of specific production and finishing techniques (Italian Ministry of Economic Development, 2018).

Thus, we can highlight on a rising need of new training programs of design managers that would focus on proposing a supply chain model that is able to integrate different methods of technological development. Some new interests of the *intelligent SME* could be the digitization of the *historical products'* archive, the optimization of manufacturing and integration to suppliers' management, the introduction of 3D modelling software in different steps of internal and outsourcing phases and the digital dialogue between design, production, distribution and sales logistics.

Design Education Programs with Joint Labs Academia-Industry

In 2012, the DIDA Department of University of Florence (Italy) developed a program of Joint Laboratories for the training of bachelor students and master students in design about advanced craftsmanship, through study and research paths that combine knowledge of the artisan tradition and innovation processes in manufacturing. Connections were therefore developed between artisanal SMEs in Tuscany and teams of students interact directly with the artisans and working on digital innovation issues of SMEs supply chain. Through these programs, companies have been able to develop, with the help of academic tutors and *digital native* students (Ferri, 2011), significant improvements in digitization and R&D. On the other hand, university had the chance to provide a higher education program in direct contact with "*Made in Italy*" production sectors.

Joint Labs Academia-Industry: Planning and Program Development

Following the Italian Ministry of Education framework, the Joint Labs programs have been developed according to following phases:

a) *Setting the Partnership*

University of Florence DIDA Design Department is used to organize vocational students' visits guided by faculties to international Design Events as Salone del Mobile of Milan, Pitti Uomo fashion fair in Florence or Maison Objet Paris. Within these happenings, the students have the chance to face directly significant design products and services, understanding the market trends and meeting significant companies. This kind of experiences become particularly relevant in case of meeting with enterprises including both design departments and manufacturing processes. In this case the students can directly investigate on how the entire supply chain can implement a design concept. This kind of visits could represent also significant chances to connect companies needs and research expectations to education and research programs.

Then, after these immersive experiences and after setting common interest on design exploration fields, University of Florence and SMEs company set a proper Joint Lab agreement, involving a team of faculties and

the enterprise referents. Joint Labs framework presents a win-win solution: University can be introduced into the company by setting specific workstations and spaces for the faculties and the students, the company can share technologies and research equipment together with the academic staff.

b) Selection of Students and Placement Programs in the Company Through Curricular and Post-Graduate Internships - duration: one month

The *pilot* research team of the DIDA Department selected a group of six students within bachelor program in Design and Master program in Design of University of Florence. For each laboratory path, students received theoretical training on traditional production techniques and digital systems *as is* or being tested in the partner company. Subsequently, the students team started the internship experience in the company. Each laboratory involved more than one internship cycle, thus involving several groups of students. The company, in agreement with the *pilot* team, prepared the necessary computer hardware and software equipment for each student: all costs were shared between the partner company and the University, with the support of regional public funding as part of European Commission's Horizon Program.

c) Training in the Company of the Students' Team and University Tutors - duration: two weeks

Following a theoretical preparation at DIDA Department, the selected students and the designated tutors started a training course in the partner company, under the supervision of the technical departments. This phase represents a strategic step to introduce and involve the students into the company as a new resource. Different Joint Lab experiences presented many *frictions* in this phase. SMEs companies are often characterized by a traditional mindset, typical of workers part of the company *family* and not open to new *fresh* collaborators. It is the duty of the faculties, as tutors, to supervise the students' introduction process and to allow them to set an appropriated work relation with the company staff.

d) Joint Lab Kick-off. Activities Developed in Semestral Cycles

Following the training phases, the technical departments of the company assigned specific tasks to the work team of the students supported by the tutors who developed a calendar of activities and reviews of the work done. The tutors follow the work of the students, setting monthly a tutorial including the proper procedures and the best practices developed by the team in this timespan. In addition, according to the company needs, the tutors set a delivery calendar about the works and commitments that have to be provided by the academic team. The students are involved in the Joint Lab through curricular or post-degree internship programs supported by Tuscany Region as part of Horizon Research Framework of the European Commission.

Joint Lab Programs Bridging Furniture and Home Details Production Processes and Academic Education: RED Design Lab and "From Design To Product" Project

RED Design Lab (Reverse Engineering Design) -active from 2012 to 2016- has been established through the agreement in between DIDA Department and the company Baldi srl, an artisan company specialized in high-end home details and furniture, crystal and bronze products (Cianfanelli et al., 2015).

The laboratory, together with the company staff, planned and started developing a digital archive of "historical productions" of the company. The work, organized in different steps and developed by different students' teams and tutors, created digital models aiming at supporting the innovation in product shapes and the optimization the production chain.

The archive has been developed through digital scanning rotating workstations, that have been used to digitalize very complex artworks and technical elements of the products. Each component has been properly transformed through advanced parametric design software as a digital form that could be transformed and redesigned to optimize the product shapes and to create new product variants. Then, digital archive doesn't stand just as a memory of company history but furthermore as a creative platform for new design challenges and new market strategies.



Figure 1. RED Joint Lab 3D Scanning

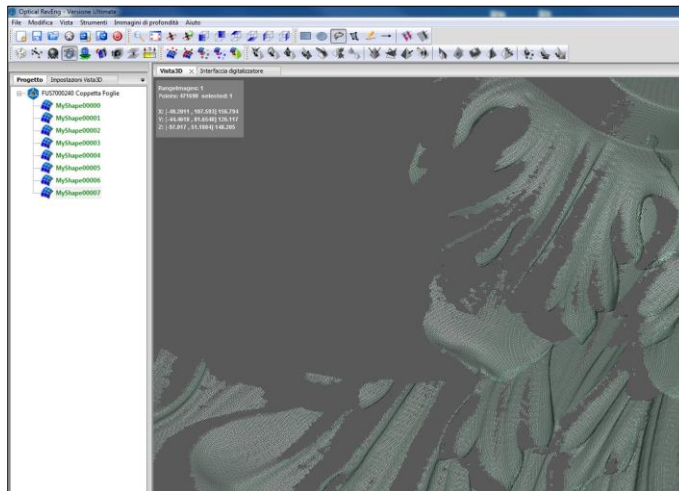


Figure 2. RED Joint Lab Parametric Design 3D Modelling

In addition, the students were involved in seminars held in the SME in collaboration with start-ups consulting companies about supply-chain management area. The program of meetings aimed at developing a PLM Product Lifecycle Management platform (Balocco et al., 2006) for the management of the manufacture and external suppliers. The operational model defined within the seminars provided a strategic methodology to include 2D and 3D digital models of the digital archive in a PLM platform, specifically customized for the company.

Therefore, we can define the RED Joint Lab goals as follows:

- Development of a digital archive of the artisanal knowledge. Kick-off of the use of the implementation of parametric modelling software (Feng & al., 2002) including technical and formal aspects of the product, the supply chain logistics and artefact storytelling, about the relation in between tangible and intangible values of the item;
- Training students about design strategies in optimization of time-to-market, providing effective response to the market by combining technical and formal strengths of the product and effective customization systems;
- Training of students about research paths on shapes and design-driven innovation in furniture product, through parametric modelling processes integrating traditional craft practices and up-to-date enabling equipment.

The rise of these new kinds of academic experiences allows some local institutions to support the agreements in between university training processes and furniture production chains. Local Institutions aimed at involving bachelor and master students into the advanced craftsmanship, boosting design research guidelines within the supply chain and setting new systemic innovation clusters within the manufacturing districts.

Economic Development Department of the Tuscany Region in 2017 presented a strategic design project for the furniture production district of Quarrata (Pistoia, Italy); linking companies and to different design education programs of the Tuscany area. The project organized a series of visits to the company for selected students. After these introductory vocational experiences each team of students has been connected to specific

production chains guided by a leading company. For each combination, the program aimed at designing a collection of products that would develop new shapes and collections for reference international markets, and that would highlight the tangible and intangible values of the supply chain.

The project "From Design to Product - Strategic Product Development Project for the Home Furnishing System" aimed at enhancing the high craftsmanship value integrated with the innovation processes related to "Time Compression Technologies" and new management organization of the supply chain. In this perspective, supply chain management systems can develop new services or new product systems, such as personalization or storytelling processes, to develop new qualities and artefact performances for the customer engagement. The research aimed at enhancing the synergy between the contractor – or the brand that commissions the work - and sub-contractors of the supply chain already including in their work some enabling Industry 4.0 (Morace, 2010) to build an archive and a reorganization of production. The project results have differentiated *primary* management systems develop synergically in between the leading company and to suppliers - properly structured and based on advanced modelling and assembling systems - from *secondary* management systems that focus just on innovative technologies of the contractor and then manage on timing and manufacturing phases of sub-contractors of the same supply chain as a top-down flow depending on the leading company.

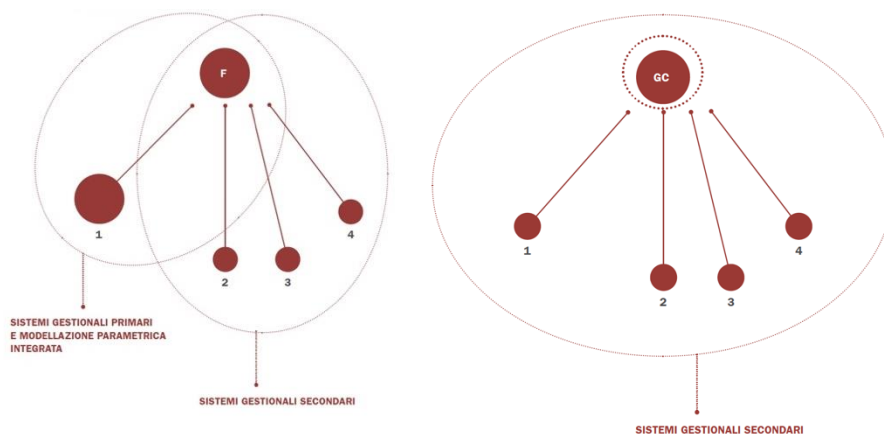


Figure 3. Digital innovation in Quarrata's Furniture District (Pistoia, Italy). The relation in between "primary" and "secondary" management systems within the SMEs supply chain.

Ecraft Joint Lab: Focus on Supply Chain Management, Product Storytelling and Up-To-Date Logistics for Ecommerce Services

Ecraft Joint Lab has been established from 2014 to 2016 in between the DIDA Department and Luisaviaroma.com, leading ecommerce company specialized in fashion and developing a new online portal about furniture design products. The training and research path aimed at defining an innovative sales and communication channel able to highlight on high craftsmanship values on luisaviaroma.com: ecommerce website leader within the European online fashion market in terms of number of online viewers per month (Cianfanelli et al., 2015).

Ecraft Lab was structured by teams of students and research fellows with interdisciplinary skills. The Laboratory staff selected products proposed by independent brands in Central-Northern Italy, as best practices in advanced craftsmanship in furniture design and manufacturing. The lab supported the company work through digital modelling and design research that could support the SMEs production. Product placements were therefore studied and performed on the website, as well as multi-channel and trans-disciplinary models of interaction design and narrative strategies (Bettioli, 2015). In particular, the lab team worked on establishing an effective link in between fashion styling and furniture design values. In addition, Ecraft project aimed at developing a new dialogue in between the global market and the intrinsic values of the local supply chains – following a "G-Local" perspective- through the pervasive power of internet and the emotional strategies that can be designed through the research on user interface design.

The Laboratory dedicated a special attention on logistics of product procurement processes coming from the participating SMEs to Luisaviaroma.com storage. This focus of the research aimed at developing a feasible time-to-market in order to make an effective response to the orders placed on Luisaviaroma.com, as well as an efficient storage management and related shipments.

Then, we could summarize on Ecraft objectives as follows:

- Product scouting area, support to the production chain, procurement and shipment logistics;
- Photography and video production for editorials development and product storytelling;
- Web graphics and strategic design.

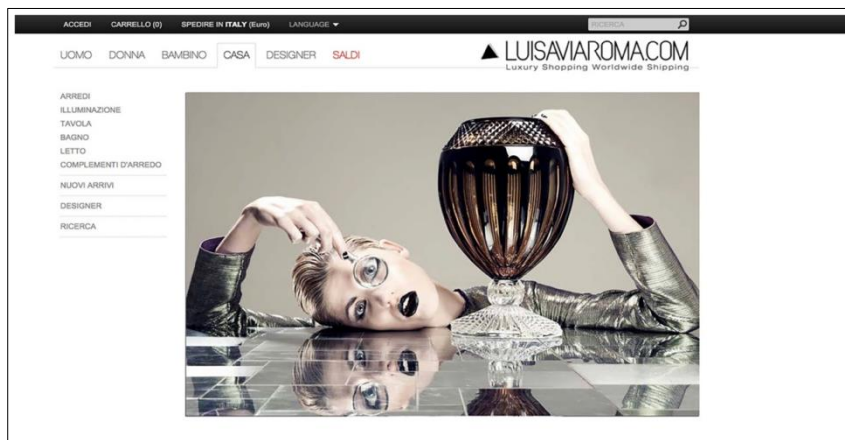


Figure 4. Ecraft editorial including home details and fashion items

Evolution of the Joint-Lab Model. From Kick-off Joint Programs to Structured Design Departments

RED Design Lab and Ecraft lab represented a first example of Joint Lab experiences in Tuscany. Since the presentation of the achievements of these research paths within *Abitare il tempo* Exhibiton in Verona (Italy) in 2014 and Milan Design Week in 2015, University of Florence have been able to develop other similar experiences among Tuscany territory. In addition, several students that participated RED Design lab have been hired by the company and developed high-profile career in design and design engineering (Cianfanelli et al., 2015).

Other significant examples from Tuscany area followed in recent years similar research processes. Savio Firmino srl, company specialized in high-end furniture characterized by craftsmanship decorations, followed the Baldi methodology in developing joint research experiences in partnership with academia from 2013 to 2017. In this case either, the research REM (Reverse Engineering for Manufacturing) focused on manufacturing digitalization through digital archive and 3D modelling technologies. Savio Firmino represented an additional success in introducing digital processes into artisanal processes. The company has reorganized since 2015 the whole production and design processes. This significant innovation program made the company able to expand its market influence by improving the time-to-market and its flexibility in responding to the emerging market trends. The joint lab best pictures and design achievements are still implemented and tested in the company design and production processes. The REM joint lab DIDA-Savio Firmino trained several junior professional profiles that created the new design Innovation department of the company. Thanks to the advancements achieved by the REM research the company was able to develop its design references and skills, developing new shapes and involving new suppliers. The collection “Welcome to The Jungle” presented at Milan Design Week 2018 and 2019, aimed at highlighting on this new creative path of the company. Manufacturing digitalization and training new professionals able to manage the innovation within the supply chain represent a strategic asset to structure and strengthen the companies’ competitiveness in the global markets. Moreover, these strategic investments of the SMEs could represent a significant booster the improve their resilience within unexpected events, as Covid-19 pandemic has shown off. Craftsmanship-based SMEs companies that present digitalization process, innovation knowledge and awareness about the potentials of technologies could face tricky times and changes with a stronger structure. Then, Joint lab models could represent a strategic research input to structure an innovation mindset, overpassing short-term production strategies and setting new perspective for medium and long-time plan for the company.



Figure 5. Savio Firmino – Welcome to The Jungle Collection 2018



Figure 6. Savio Firmino – Digital Archive

Conclusions

The research background and experiences described the general contemporary trend of SMEs production systems that require a complex and many-sided approach on digital innovation and enabling technology issues.

In this sense, some ongoing and future design educational programs could be established in partnership to strategic companies. This synergic agreement could provide students a big-picture overview on design and production flow and complexity of the supply chain, not just through partial focuses on specific manufacturing steps. In addition, small companies represent a strategic chance for the students to be in touch with the workers, technical departments and real production chain, a significant experience for their education that could be rarely developed within big corporations.

The skills acquired from the students can be directly applied to the real company context, supporting the entire digitization management process to implement innovation programs on three different levels:

- *the process*: the application of digital enabling technologies both in the phases with low added value and in the most characteristic phases of manufacturing process -as a tool for the enhancement of craftsmanship quality and values (Micelli, 2011);

- *logistics*: the management of transport that implements the traceability of the product, promoting knowledge about “where” and “how” the products is made. Thus, highlighting the qualities related to the territory and socio-cultural aspects that strongly characterize “*Made in Italy*” productions;

- *the story*: using digital platforms virtuously to tell and make the peculiarities of Italian production highly recognizable not just for the local customer but also for the global market audience (Bettiol, 2015).

Regarding the process, the reconstitution of craftsmanship qualities and its values can be achieved through the use of new technologies. In fact, their use can guarantee a reconstruction of those aspects connected to skills and traditional techniques (Micelli 2011). Their support is realizing a process based on the interconnection between different production components and an approach oriented towards process and product innovation (Bettarini & Targliatore, 2018). This is a general way a flexible business model is configuring for SMEs that implement Industry 4.0 as a technological and organizational approach to re-evaluate existing production resources in a more *intelligent* way (Magone & Mazali, 2016).

Logistics is also rethought in this sense, configuring three levels of application: Smart Lifecycle, Smart Supply Chain and Smart Factory, which can be defined as follows:

- Smart Lifecycle, which includes the development process of a new product, the management of its life cycle and the management of the suppliers involved in these phases;
- Smart Supply Chain, which includes the planning of physical and financial flows in the expanded logistic-production system;
- Smart Factory as the process that represents the heart of manufacturing: production, internal and external logistics, maintenance, quality, safety and compliance with regulations.

According to these three levels, Industrial IoT, Analytics and Cloud stand as relevant factors.

According to Marco Taisch, scientific director of the Osservatorio Industria 4.0, in 2019 these technologies favored a growth of 22%, almost tripled in four years for a total of 3.9 billion euros (Fiertler, 2020). It is possible to frame the development of these operative systems between 2019 and 2020 by looking at the three areas of application in the entire production process. In the lifecycle, Cloud Manufacturing has increased up to 45%, Additive Manufacturing has an application rate of 23%; at the supply chain level, Industrial Analytics grew by 30%, against a growth of 85% for Cloud Manufacturing; the level of the smart factory is the one that mostly highlights on a development through the application of three different technologies. In fact, The IoT has undergone an increase of 20%, Cloud manufacturing by 35% and Advanced Human-Machine Interaction by 30% (Osservatorio Industria 4.0, 2020).

Finally, companies will have to learn to communicate all these characteristic aspects of their identity through new media, because these factories are the hallmarks of Italian manufacturing production that has been able to constantly reinterpret the know-how of tradition, ensuring that manufacturing production became a “cultural manufacturing”, able to produce artifacts with a great technical quality that have ended up feeding and elaborating cultural contents (Bettiol, 2015). Furthermore, Bettiol declares that advanced craftsmanship, design innovation, personalization and authenticity are the elements that characterize this cultural manufacturing values and that contribute to increasing its attractiveness towards the national and international consumer (op. 2015), as demonstrated by Savio Firmino srl case history.

References

- Atti, G. (2018). L'impresa intelligente e la rivoluzione digitale, In G. Atti (Ed.), *La quarta rivoluzione industriale: verso la supply chain digitale* (pp. 57-160). Milano: FrancoAngeli.
- Balocco, R., Mainetti, S., Rangone, A. (2006). *Innovare e Competere con le ICT*. Milano: Il Sole 24 Ore.
- Bettiol, M. (2015). *Raccontare il Made in Italy: un nuovo legame tra cultura e manifattura*. Venezia: Marsilio.
- Bettarini, U. e Tartaglione, C. (2018). *Le nuove professioni 4.0 nel sistema moda. Un approfondimento sull'impatto dell'innovazione e del cambiamento sulle professioni nel tessile abbigliamento, pelletteria-conia e calzature*. Roma: Ares 2.0.
- Cianfanelli, E., Goretti, G., Baccolini, R. (2015). RED4MART. Reverse engineering for manufacturing digital archive to enhance advanced craftsmanship know-how and high-end manufacturing values, In Collina L. Galluzzo L., Meroni A., *The Virtuous Circle Design Culture and Experimentation*. Milano: McGraw-Hill Education.
- Cianfanelli E., Goretti, G., Aiello R., Baccolini R. (2015). UX designers education and practice: Making designer as topic connectors to enhance intrinsic complex values of made in Italy craftsmanship. e.craft joint lab case history at Luisaviaroma.com. In Collina L., Galluzzo L., Meroni A., *The Virtuous Circle Design Culture and Experimentation*. McGraw-Hill Education Italy.
- De Fusco, R. (2009). *Storia del Design*. Bari: Laterza.
- Di Lucchio, L. (2005). *Il design delle strategie: un modello interpretativo della relazione tra design e impresa*. Roma: Gangemi Editore.
- Feng, P., Chen, Y., Zhang, S., Pan, S. X. (2002). Product Gene Based Conceptual Design. *Chinese Journal of Mechanical Engineering*, 38(10), 1-6.
- Ferri, P. (2011). *Nativi Digitali*. Milano: Mondadori.
- Fry A., Goretti, G., Ladhib, S., Cianfanelli, E., Overby, C. (2016). Advanced Craft, integrated with the Saper Fare; the role of Intangible value, and the centrality of the artisan in high-quality 21st Century Artisanship, In *Cuaderno Journal, Emerging Processes in Design Practice and Design Education*, University of Palermo Buenos Aires (Argentina).
- Goretti, G. (2017). *Advanced Craftsmanship - Maestria Avanzata. Percorsi di progetto tra innovazione e tradizione artigianale nei sistemi manifatturieri Toscani*. Roma: Aracne.
- Fiertler, G. (2020, June 23). Industria 4.0: IoT, Analytics e Cloud continuano la corsa. In *Industriequattropuntozero*. Retrieved from <https://www.industriequattropuntozero.it/2020/06/23/industria-4-0-iot-analytics-e-cloud-continuano-la-corsa/>
- Lanzone, G., Morace, F. (2010). *Verità e bellezza*. Busto Arsizio: Nomos Edizioni.
- Magone, A. e Mazali, T. (2016). *Industria 4.0: Uomini e macchine nella fabbrica digitale*. Milano: Guerini e Associati Edizioni.
- Micelli, S. (2011). *Futuro artigiano: l'innovazione nelle mani degli Italiani*. Venezia: Marsilio.
- Minetto, R. (1999). *Milan Design System - Sistema Design Milano*. Milano: Abitari Segesta.
- Ministero dello Sviluppo Economico. (2018). *Piano Nazionale Industria 4.0*. Roma: Ministero dello Sviluppo Economico. Retrieved from http://www.sviluppoeconomico.gov.it/images/stories/documenti/impresa_40_risultati_2017_azioni_2018.pdf
- Morace, F. (2010). *Il Talento dell'Impresa*. Milano: Nomos.
- Osservatorio Industria 4.0. (2020). Tutto su industria 4.0. Milano: Osservatorio Industria 4.0. Retrieved from <https://www.osservatori.net/it/ricerca-per/transizione-industria-40>
- Rullani, E. (2016). Il futuro del Made in Italy: una sfida da condividere, In G. L. Gregori (Ed.), *Made in Italy: una lettura critica fra eredi virtuosi e dissapori* (pp. 9-22). Bologna: il Mulino.
- Schwab, K. (2016). *La quarta rivoluzione industriale*. Milano: Franco Angeli.

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Author Index

- Aktaş, Bilge Merve, 553
Al Bess, Mariam, 592
Alesandro, Mariano, 216
Allende, Natalia, 59, 212
Ashley, Hall, 879
Ata, F. Zeynep, 746
Aulisio, Asja, 529
Aysel, Kardelen, 414
Barbero, Silvia, 529, 807
Baskår, Ellen, 567
Bauer, Birgit, 900
Beniwal, Sucharita, 277
Bennett, Audrey G., 338
Berg, Arild, 476
Bernado, Alyssa, 592
Bohemia, Erik, 3, 50, 1061
Bonde Sørensen, Kirsten, 138
Börekçi, Naz A.G.Z., 3, 30, 322, 380
Bosch, Noora, 68
Brænne, Karen, 222
Bravo, Úrsula, 59, 91
Brewer, Joe, 451
Brosens, Lore, 859
Butoliya, Deepa, 338
Calabi, Daniela Anna, 756
Campanella, Alessandro, 807
Chang, Jui-Feng, 184
Chen, Fan, 459
Chen, Qingxuan, 78
Chew, JiaYing, 489
Christiansen, Line Gad, 280
Chu, Hsiao-Yun, 1072
Clive, Grinyer, 879
Cortés, Catalina, 59, 216
Cruz, Christian, 910
De Francisco Vela, Santiago, 499
de Reuver, Rik, 626
de Sainz-Molestina, Daniela, 358
de Souza Couto, Rita Maria, 294
Denaro, Gianni, 369
Derksen, Gerry, 1044
Detand, Jan, 516
DeVita, Julienne, 660
Dewhirst, Hannah, 451
Digranes, Ingvild, 604
Ding, Meng Yue, 772
Dittenberger, Sandra, 868
Doğan, Fehmi, 737, 746
Donaldson, Christina, 405
Dormor, Catherine, 540
Edwards, Allison, 318
Efilti, Pelin, 934
Eftekhari, Farzaneh, 167
Eglash, Ron B., 338
Emans, Denielle J., 424
Emmanouil, Marina, 516, 859
Fan, Chunhong, 823
Fan, Yun, 1061
Fauske, Laila Belinda, 222
Fausto Medola, 476
Feng, Yi Jia, 772
Fernando, Galdon, 879
Ferrarello, Laura, 540
Ferrulli, Eliana, 807
Fu, Ge, 718
Galli, Francesco, 1044
Gao, Muxing, 432
Gelmez, Koray, 934
Gibson, Michael, 405
Gieben-Gamal, Emma, 307
Glyn-Davies, Adela, 816
Gomez, Gloria, 848
Goretti, Gabriele, 369
Goso, Nick, 592
Graf, Roland, 338
Gray, Colin M., 439, 830
Groth, Camilla, 476, 553
Gudiksen, Sune Klok, 280
Guo, Carol, 100
Güvenir, Can, 414
Guzman-Abello, Laura, 499
Hanrahan, Tara, 315
Hansen, Anne-Marie, 923
Härkki, Tellervo, 68
Hartvik, Juha, 604
Hasdoğan, Gülay, 322, 327, 380
Hee, Lee Chang, 879
Hensel, Daniela, 900
Hetu, Ruslan, 592
Hilton, Clive, 432, 816
Ho, Chun-Heng, 1038
Ho, Meng-xun, 111
Hoftijzer, Jan Willem, 626, 679
Hofverberg, Hanna, 222, 226
Hokinson, Brad, 152
Homlong, Siri, 222
Hou, Shumeng, 78
Howell, Bryan F., 626, 660, 679
Hsiao, Hsu-Chan, 960
Hsiao, Yu-Ting, 960
Hu, Yi Ke, 772
Hughes, Benjamin, 607, 613
Hyland, Peter, 405
Inamura, Tokushu, 910
Ito, Shinichiro, 910
Jackson, Asa R., 660

Jahanbakht, Mohammad, 167
Jiang, Ke, 613
John, Stevens, 879
Johnson, Keesa V., 338
Jones, Derek, 35
Kang, Zhi Hao, 772
Kannegiesser, Ella, 631
Kardar, Yashar, 856
Kashyap, Shantanu, 830
Keane, Linda, 687
Keough, Madeline, 631
Ketterer, Annaka, 631
Klingelfuss, Janey Deng, 948
Klingelfuss, Markus, 948
Koçyıldırım, Dalsu Özgen, 30
Korkut, Fatma, 30, 322, 380
Korsmeyer, Hannah, 277, 318
LaFors, Jeannette, 59
Lahti, Henna, 395
Lanig, Andreas Ken, 800
Laura, Ferrarello, 879
Lee, Henry, 660
Lenaers, Steven, 844
Li, Juan, 111
Li, Lin, 459
Li, Yijing, 581
Li, Zhe, 111
Li, Ziqing, 439
Lin, Xing-Min, 1038
Lin, Yang-Cheng, 196
Liow, Zhengping, 123
Liu, Shuo-fang, 111, 184
Liu, Wei, 439
Liu, Yuan, 756
Lotz, Nicole, 687
Low, Jenn, 338
Lu, Peng, 196
Luo, Shunhua, 823
Lutnæs, Eva, 222, 264
Ma, Chunli, 581
Maivorsdotter, Ninitha, 226
Marinovic, Lukas, 439
Marques Leitão, Renata, 277
Mathew, Deepak John, 789
Maus, Ingwill Gjerdrum, 222, 245
McDonald, Kevin, 439
McMahon, Bree, 1055
Medola, Fausto, 476
Meeks, Victoria, 631
Milovanovic, Julie, 987
Moritsch, Stefan, 868
Muñoz Novoa, Mauricio, 626
Murdoch-Kitt, Kelly M., 424
Nack, Frank, 232
Neubauer, Ruth M., 780
Nielsen, Liv Merete, 3, 45
Nilsson, Elisabet M., 923
Noel, Lesley-Ann, 255, 277
Novoa Muñoz, Mauricio, 679
Nunziante, Pietro, 479
Nyboer, Jody, 152
Octavia, Johanna Renny, 859
Ölmez, Duhan, 737
Omwami, Anniliina, 395
Örnekoğlu-Selçuk, Melis, 516
Owens, Keith, 405
Özçelik, Ayşegül, 856
Paepcke-Hjeltness, Verena, 631, 676
Pan, Lusheng, 1
Pardo Rodríguez, Santiago, 499
Paul, Anderson, 879
Pei, Jing, 581
Pereno, Amina, 529
Perna, Stefano, 479
Persaud, Nav, 592
Petermans, Ann, 689
Pintsuk-Christof, Julia, 868
Porko-Hudd, Mia, 604
Portas, Roberta, 294
Quartier, Katelijjn, 996
Radtke, Rebekah, 451
Raes, Annelies, 859
Raschauer, Agnes, 868
Rawlings, Rebekah, 660
Reitan, Janne Beate, 222
Riccò, Dina, 756
Rivera, Maritza, 91
Rocha, Andréia, 338
Rodriguez Diaz, Jose Manuel, 679
Rovera, Fabiana, 529
Rute, Fiadeiro, 879
Sadowska, Noemi, 315
Sariel, Selen, 1028
Schiller, Ayla, 631
Schmidt, Ingrid, 451
Schouten, Ben, 232
Seitamaa-Hakkarainen, Pirita, 68, 395
Sellen, Kate, 476, 592
Seydioglu, Sarper, 856
Shafieyoun, Zhabiz, 1044
Sharbafi, Farnoosh, 167
Shehab, Saadeddine, 100
Shi, Han, 581
Shieh, Meng-Dar, 960
Slone, Ryan, 1055
Sobel Luttenberg, Ruthie, 212
Solanki, Chaitanya, 789
Solberg, Anne, 567
Soliman, Habiba, 592
Song, Zhihang, 581
Stevens, Ruth, 689
Sun, Lei, 1012
Sypsteyn, Mark, 626
Tamblyn, Rodney, 848

Tatlisu, Enver, 934
Taverna, Andrea, 358
Taylor, Anne P., 703
Tellez, Fabio Andres, 59
ten Brink, Marije, 232
Thoring, Katja, 687
ThoringKatja, 687
Toombs, Austin L., 439
Tüfek, Tuğçe Ecem, 934
Umali, Norm, 592
Vande Zande, Robin, 931
VandeZande, Robin, 38
Vanrie, Jan, 689
Von Lachman, Marianne, 294
Voß, Stefanie, 900
Wang, Ziyuan, 920
Wecht, Christoph H., 780
Wei, Rong, 432
Werle, Stuart, 592
Wilkinson, Andrea, 844
Winchester III, Woodrow W., 277

Wolford, Christopher, 830
Wu, Chang-Tzuoh, 184
Wu, Fan, 196
Xia, Lu-Ting, 1038
Xia, Xiang, 920
XU, Yuanyuan, 1003
Xue, Feng, 581
Yalman-Yıldırım, Zeynep, 327
Yang, Jingrui, 823
Yang, Jing-Yi, 459
Yang, Shangshang, 581
Yazirlioğlu, Lilyana, 856
Yılmaz, Onur, 934
Yin, Xuejiao, 78
Yu, Jianglong, 1061
Zhang, Wendy, 679
Zhang, Yanfang, 910
Zhang, Yang, 3, 920, 1061
Zhao, Yue, 830
Zheng, Jianpeng, 976
Zhu, Ming, 647

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