Big Data and Data Analytics in auditing: in search of legitimacy

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Abstract

Purpose—This study analyzes the utilization of Big Data and Data Analytics (BDA) in financial auditing, focusing on the process of producing legitimacy around these techniques, the factors fostering or hindering such process, and the action auditors take to legitimate BDA inside and outside the audit community.

Design/Methodology/Approach—The analysis bases on semi-structured interviews with partners and senior managers of Italian audit companies.

Findings—The BDA's legitimation process is more advanced in the audit professional environment than outside the audit community. The Big Four lead the BDA-driven audit innovation process and BDA is utilized to complement traditional audit procedures. Outside the audit community, the digital maturity of audit clients, the lack of audit standards, and the audit oversight authority's negative view prevent the full legitimation of BDA.

Practical implications—This research highlights factors influencing the utilization of BDA to enhance audit quality. Our results can thus be utilized to enhance the audit strategy and to innovate audit practices by using BDA as a source of adequate audit evidence. Audit regulators and standards setters can also utilize our results to revise the current auditing standards and guidance.

Originality/value—This study adds to the literature on digital transformation in auditing by analyzing the legitimation process of a new audit technique. The paper answers the call for more empirical studies on the utilization of BDA in financial auditing by analyzing the application of such techniques in an unexplored operational setting in which auditees are mainly medium-sized enterprises and family-run businesses.

Keywords: big data analytics; audit technologies; audit innovation; legitimacy

Paper Type: Research paper

1. Introduction

This study analyzes the legitimacy production process of Big Data and Data Analytics (BDA) in financial auditing activities and examines the factors that foster or hinder this process. Our research bases on an exploratory study in which we carried out 16 interviews with partners and senior managers of Italian audit companies.

Nowadays, the world's increasing digitization provides a high volume, a high velocity, and a high variety of data—the Big Data—that offers opportunities to innovate several business processes (Tang and Karim, 2017), including accounting and auditing (Bhimani and Willcocks, 2014; Vasarhelyi *et al.*, 2015). With the spread of BDA technologies (Gandomi and Haider, 2015), academics (Cao *et al.*, 2015; Earley, 2015) and professional associations (ACCA, 2015; AICPA, 2017; IAASB, 2016) underline that BDA can act as a game changer also in innovating auditing practice and in improving financial audit quality. Furthermore, large international audit networks have all advertised research projects and investments for the development of new BDA tools to support auditors in the analysis of vast amounts of data that are stored internally to the audited companies or that are available externally (EY, 2015; KPMG, 2020). Despite these claims, anecdotal evidence from partners at leading audit firms indicates that these technologies are still not as widespread as they are in other business fields (Austin *et al.*, 2020; Gepp *et al.*, 2018).

This scarce adoption of BDA in the practice of auditing may derive from a lack of legitimacy. Consistently with Robson *et al.*(2007), we believe that in order for new audit methodologies like those related to the utilization of BDA to be adopted and spread, audit firms must produce legitimacy for such new audit methodologies in the institutional field and build a supportive environment for their adoption.

We know that standards dictating how audit firms should structure their practice constrain statutory auditing (Knechel, 2013). The existence of dedicated standards can thus favor the utilization of new assurance tools, while the absence of dedicated standards can obstruct innovation. Extant standards do not explicitly provide guidance on how to utilize BDA in order to conduct an

audit engagement (Alles, 2015; Cao *et al.*, 2015) and enhance audit quality[1]. Since the lack of a standard would negatively impact on the BDA utilization's legitimacy, it is interesting to analyze whether and how practitioners produce legitimacy around these techniques in the institutional field to strengthen audit quality and also to safeguard auditors' responsibility in the case of litigation against financial reporting users, auditees, and oversight bodies.

The emergence and development of new audit methodologies have long been influenced by auditors' attempts to secure the legitimacy of such new methodologies with client audiences (O'Dwyer *et al.*, 2011). Concerning BDA, commentators point out that clients' utilization of Big Data in financial reporting processes may foster the adoption of BDA techniques for different reasons (Alles, 2015), such as to obtain more audit evidence, to reduce audit risk, and to enhance audit reputation in the marketplace (Curtis and Turley, 2007). The Italian audit market is mostly characterized by medium-sized enterprises and family-run businesses that are not confident about business analytics in financial reporting processes, and this may obstruct the utilization of BDA. It is worthwhile to examine whether and how auditors try to produce legitimacy around BDA for improving their relationship with clients and for gaining audit efficiencies in order to respond to the increasing fee pressure.

Regarding the legitimation process of new assurance practices, studies indicate that a practice is legitimate when the results it produces are congruent with the value system of the entity that introduced the new practice and with the value system of the wider social environment to which the entity belongs (Abbott, 1988; Suchman, 1995). The legitimacy-building process undergoes two distinct but intertwined phases, the first internal to the audit profession and the second related to the external world of audit (O'Dwyer *et al.*, 2011). The audit professional environment refers to audit practitioners and the legitimation process can be observed among practitioners working for the

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[1] Auditors can use BDA techniques (e.g. text mining and sentiment analysis) in the engagement planning to identify and assess financial statements areas with high inherent risk. BDA techniques, such as process mining, can improve the auditors' assessment of the company's Internal Control System. Furthermore, BDA can be used to improve substantive analytical procedures by testing 100% of transactions instead of samples. Further details on how BDA technologies can enhance audit quality is reported in Section 2.1.

same professional service firm and among practitioners operating in the same audit environment. Legitimacy is <mark>achieved</mark> in the professional environment when practitioners approve the manner in which audit work is performed by means of the new technique. The external world of audit comprises both audit clients and non-clients, such as financial statements users, standard setters, regulators, and oversight authorities. Legitimacy manifests here when clients become convinced of the audit's value and of its ability to address the clients' needs, while non-clients must acknowledge that the results of the new practice fulfil their assurance expectations (Abbott, 1988; O'Dwyer *et al.*, 2011).

These considerations lead us to ask: How can BDA be accepted and recognized as a legitimate technology inside and outside the professional audit community? To this end, we examined the BDA-legitimacy-building process among practicing Italian auditors.

This study leads to a number of relevant insights. Auditors who have large and listed Italian companies as their usual clients are in the midst of the legitimacy production process, as they introduced BDA to complement traditional audit procedures. Auditing companies who serve mostly medium enterprises and family firms still rely on traditional audit procedures. Auditors generally seek to gain consensus on the utilization of BDA with clients, standard setters, and regulators. To achieve the full institutionalization of BDA, standard setters must explicitly recognize these techniques and the auditors' digital maturity must be aligned with that of the auditees.

This exploratory research contributes to both theory and practice. First, the research answers the call for more empirical studies on the utilization of BDA in financial auditing (Salijeni *et al.*, 2019; Wang and Cuthbertson, 2015). Our findings contribute to the constant debate on the opportunities and threats associated with the utilization of BDA techniques in financial auditing activities. Second, we add to the growing literature on digital transformation in auditing by analyzing the legitimation process of a new audit technique from the perspective of practicing auditors in order to capture the factors that can foster or hinder such a process (Pasewark *et al.*, 1995). Thereby, our study responds to Power's (2003) request for more studies on the role of

auditors in producing legitimacy. Third, practitioners can use our findings to identify the factors influencing the utilization of BDA in their work. Furthermore, our results can be used for benchmarking purposes and to support the planning of an audit strategy. Moreover, audit regulators and standards setters can use our results for their evaluations about the legal audit environment in order to assess the opportunity to change the current auditing standards and guidance.

The paper is structured as follows. The next section provides a review of the most relevant literature on BDA's opportunities in financial statements audit and on the process of legitimacy production in the auditing field; the next section also outlines the research questions. The third section describes the methodology. The fourth section presents the empirical findings according to the adopted interpretive framework. The final section provides conclusions and contemplates an agenda for future research.

2. Background and research questions

2.1 BDA in auditing

At present, the utilization of Big Data transforms the manner in which businesses are run to become more agile, customer-oriented, and effective (Reinsel *et al.*, 2018). This is true, also in the auditing environment. Several studies highlight that BDA techniques have the potential to transform the manner in which financial statements audits are performed, making them more efficient and effective (Arnold, 2018; Gepp *et al.*, 2018; Krahel and Titera, 2015; Zhang *et al.*, 2015). What differentiates the utilization of BDA from other technologies introduced over time to improve the audit process—whether it be Excel, ACL, or the Internet itself—lies in the convergence of substantive advancements in data science, increases in computer power, and the opportunity to access huge amounts of data and information. This convergence created an environment that is ripe for the application of BDA in almost every industry, stimulating transformative thinking within the audit profession (Stewart, 2015).

BDA encompasses a wide range of tools that can contribute to every phase of the audit process. Regarding the pre-engagement phase, auditors can use text mining and sentiment analysis techniques to examine press releases and social networks in order to assess the reputation of the potential client and that of its key persons, for example, the CEO, the CFO, and the Board Chair. Moreover, auditors can use clustering techniques to compare the financial statements of a potential client with data from companies in the same industry to form a first opinion regarding the company's financial health conditions (Appelbaum *et al.*, 2018; Rose *et al.*, 2017). The abovementioned BDA techniques can support the decision to accept an audit engagement and estimate the audit fee. During the planning phase, clustering, descriptive analytics, and regression can complement traditional analyses and support auditors in obtaining a more granular visualization of the audited entity and its environment in order to identify and assess financial statements areas with higher inherent risk and to determine materiality thresholds (Cao *et al.*, 2015; Earley, 2015).

BDA can also be utilized to analyze the company's internal controls. For example, process mining tools can be used to conduct compliance tests, such as a walkthrough, that enable auditors to identify violations of segregation of duties controls or other deviations from internal procedures, for example, documents mismatching or lack of authorizations (Jans *et al.*, 2013). When auditors perform analytical procedures and substantive tests, BDA contributes to expand the breadth of their verifications (Dai and Vasarhelyi, 2016), as BDA makes it possible to simultaneously analyze and visualize entire populations of transactions instead of samples in order to reveal unexpected patterns and outliers worthy of deeper investigation. Through BDA, auditors can also compare a client's financial data against benchmarks and expectation models to identify potential inconsistencies (Appelbaum *et al.*, 2018; Stewart, 2015).

In sum, BDA can serve as a complementary source of sufficient, appropriate, and real-time audit evidence, thus offering enhanced opportunities for auditors to detect corporate frauds and accounting misstatements (Cao *et al.*, 2015; Gray and Debreceny, 2014; Moffitt and Vasarhelyi, 2013; Yoon *et al.*, 2015).

2.2. The legitimacy production process

Organizational studies define legitimacy as a condition or a status of congruence between the entity's value system and that of the larger social system to which the entity belongs (Abbott, 1988; Dowling and Pfeffer, 1975). In line with these studies, Suchman (1995, p. 574) defines legitimacy as a "generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed system of norms, values, beliefs and definitions". We based on this definition of legitimacy to develop our study.

To investigate the process of constructing legitimacy around BDA as a new audit technique, we start from the assumption that legitimacy is not a stable condition, but it "must be repeatedly created, recreated and conquered" as the field in which it is socially constructed matures (Suddaby *et al.*, 2017, p. 463). This process is therefore iterative and evolves to keep pace with the changes in the social environment.

The focus of our analysis is the process of building legitimacy for BDA. To this end, we used the model developed by Greenwood *et al.* (2002, pp. 59–61), which is widely accepted to analyze the process of building legitimacy around audit innovations. This model identifies three different types of legitimacy corresponding to three sequential stages of the iterative processes, namely *moral*, *pragmatic*, and *cognitive*. To achieve each of the proposed levels of legitimacy, an innovation should first stimulate a change within an organizational field and deinstitutionalize established practices. To become fully institutionalized, the innovation then requires to be legitimated both within and outside the organizational field.

According to Greenwood *et al.* (2002), an innovation becomes institutionalized by going through six distinct stages. First, a change occurs when an event—a purported jolt, such as technological disruptions or regulatory changes—destabilizes established practices (stage I). This change leads to the deinstitutionalization stage (stage II) during which actors in the field, irrespective of whether they are new entrants or existing actors, introduce new ideas that disturb the socially constructed consensus around the practices established within the field. Once the possibility

of change has been introduced, organizations start innovating independently and seek technically viable solutions to locally perceived problems (stage III, named pre-institutionalization). The first three stages deal with the legitimacy that an innovation gains inside a professional community and with the actions practicing professionals undertake to build such legitimacy.

From this point onward, innovations require three further stages, namely theorization (stage IV), diffusion (stage V), and re-institutionalization (stage VI) to become fully institutionalized. Otherwise, they will be ignored and dismissed as fads. The theorization stage in which both the *moral legitimacy* and the *pragmatic legitimacy* of the new practice are established, consists in describing the properties of the new practice and explaining the outcome it produces such that the new practice becomes available for wider adoption in the field. Innovation here is presented as the solution for or the treatment of a general failure or problems encountered in the organizational field (*pragmatic legitimacy*). Practitioners can also contribute to the *moral legitimacy* of a new practice when they are able to demonstrate that it achieves socially desired and socially valued results through acceptable and sound procedures (O'Dwyer *et al.*, 2011). Successful theorization leads to diffusion (stage V) during which the *pragmatic legitimacy* of the new practice becomes recognized among the actors within the field. An innovation can be considered pragmatically legitimate when it is perceived as able to respond to the interests of its most immediate audiences. Lastly, full institutionalization (stage VI) occurs when the new practice acquires *cognitive legitimacy*, i.e. when the new practice becomes taken for granted as the natural and appropriate arrangement. The last three stages concern the manner in which innovations gain legitimacy outside a professional community in the wider organizational field in which practitioners operate.

The idea that legitimacy is an ongoing process that starts from the ground and spreads toward the social environment (Suddaby *et al.*, 2017) is also supported by O'Dwyer *et al.* (2011) who distinguish two distinct worlds in which legitimacy is sought: the internal and the external world. The internal world refers to the auditors' professional environment, which includes the audit practitioners themselves who must approve how the new technique reshapes the manner in which

they perform their work. The external world of audit comprises audit clients that must be persuaded of the audit services' value-adding capability, as well as non-clients, such as financial statements users, standard setters, regulators, and oversight authorities who must acknowledge that the results of the new practice can fulfil their assurance expectations.

The interpretive model used to conduct our research is presented in Figure 1.

[Insert Figure 1 about here]

The idea that legitimacy construction is an iterative and multistage process is also consistent with the explanatory schema proposed by Power (2003) to guide academic research on auditing change. The author suggests to analyze, first, the events that stimulate a change within an organizational field, i.e. the controversy phase; these events may derive from a crisis of trust in the audit profession (Sikka, 2009) or the need to update audit technology to follow changes of the client's IT system (Cao *et al.*, 2015). Second, the analysis must focus on the co-evolving processes of establishing the innovation and constructing consensus around the new practice among professionals, i.e. the closure phase. Lastly, research on legitimation processes of changes in the practice of auditing should investigate the key role auditors assume in constructing legitimacy outside their professional community, i.e. the credibility phase, by persuading the wider social environment of the new practice's value such that the audit field can proceed toward new institutional alignments (Power, 2003; Robson *et al.*, 2007).

2.3 Research questions

Making use of the literature review, we know that the utilization of BDA in the audit process depends on the success of a legitimation process that first takes place in the audit professional environment. Studies indicate that any change in the audit approach must first be legitimated by the practitioners themselves who must de-institutionalize the old approach and support audit innovation within their professional service firms and among other practitioners working in the same audit

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environment (Fischer, 1996; O'Dwyer *et al.*, 2011; Power, 2003; Suddaby *et al.*, 2017). Stemming from this, we formulated the following research question:

RQ1: *How do auditors presently act to legitimate the utilization of BDA techniques within the audit professional environment?*

For an audit innovation to become fully institutionalized, i.e. for it to be spread and become accepted as a desirable and uncontested source of audit evidence, auditors must construct the audit innovation's legitimacy with their external world that comprises not only auditees but also financial statements users, regulators, standard setters, and oversight bodies by convincing these parties that the new practice improves the audit services' value-adding capability, while simultaneously maintaining a high level of assurance (O'Dwyer *et al.*, 2011; Robson *et al.*, 2007). This consideration leads us to the following research question:

RQ2: *How do auditors presently act to build legitimacy around BDA techniques in the external world?*

3. Research methodology

Given the exploratory nature of this study, we adopted a qualitative approach to carry out our analysis. This paper relies on evidence gathered through 16 semi-structured interviews with partners and senior managers of eight audit firms operating in Italy.

Semi-structured interviews give the opportunity to deal with phenomena for which a consolidated knowledge does not yet exist and promote flexible data collection, allowing respondents to touch upon emerging aspects that were initially not directly included in the interview's structure (Griffith *et al.*, 2015). Moreover, to ensure the opportunity to develop further analyses during the interviews, only open-answer questions were posed such that auditors were able to spontaneously express their personal opinions on the topics under investigation and the researcher could have an adequate understanding of the issues at hand (Lillis, 1999). Lastly, this

interview method allows the discovery of logical patterns and connections between different topics touched upon by the respondents, which is particularly significant for the purpose of this study.

The Italian context's characteristics enable to investigate the legitimation production process of BDA techniques in financial auditing and to produce research findings that may be of interest to an international audience for several reasons. First, the Italian audit market comprises companies with a high variety in terms of ownership structures, i.e. multinational companies vs. family firms, the skills of CFOs, the skills of CEOs, and the IT systems' degree of evolution. This variety can affect the auditors' decision to utilize BDAs in financial auditing activities, as these techniques may be perceived as suitable for carrying out audit engagements in certain companies but not in others. Second, in Italy the non-Big Four mainly serve medium-sized companies and family businesses in which accounting processes are less advanced from an IT perspective. This can also hinder the use of BDA techniques by the non-Big Four. As these characteristics of the Italian audit market (i.e. audit clients' variety, non-Big Four's focus on clients with unsophisticated accounting systems) can also be found in other countries, our findings are generalizable to similar audit environments.

The interviews were carried out between October 2017 and April 2018 (see Tables 1—3).

[Insert Table 1 about here]

[Insert Table 2 about here]

[Insert Table 3 about here]

The interviewees include auditors from the Big Four and non-Big Four audit firms, identified primarily through the authors' contacts. The authors have described the objective of the study to each of the contacted companies; furthermore, the authors have communicated what the interviewees' desired characteristics were in order to involve people with a significant expertise in financial auditing as well as a particular active involvement with BDA in the audit field. For each audit firm that accepted to participate, two distinct interviews were conducted. The first interview was with a partner who did not necessarily have a BDA background. Partners have a key role in defining the audit strategy, the audit team composition, and the technological tools to be used

during the audit work. The second interview involved partners and/or senior managers with a particular involvement in BDA projects, as they have specific responsibility for developing or adopting innovative technological solutions.

The reason for this choice is twofold. First, one can reasonably presume that auditors involved in BDA project development are better able to understand, also via critical reasoning, the different implications that these technologies have for the audit activity. Second, a high level of expertise in the field of financial audit but without a specific focus on BDA tends to enable a better understanding of the context in which the utilization of BDA would improve the audit quality and helps legitimate the audit work performed by means of these technologies. Participants with such characteristics are presumably able to better assess contextual factors that might facilitate or hinder the adoption of BDA such that it would be possible to trace more generalizable conclusions (Cohen *et al.*, 2002).

The interviews ranged in length between 45 minutes and one hour. All the interviews were recorded and transcribed, and then they were analyzed. For confidentiality reasons expressed by the interviewees, in the remainder of this paper no reference will be made either to the companies or to the details of the participants in the study and their opinions are reported anonymously. In order to overcome bias, the analysis was carried out through analyst triangulation (Patton, 1990; Yin, 2017); thus, it was designed such that one of the researchers was in charge of the data collection, while the other examined the interview material and the notes in order to analyze all the emerged evidence. Lastly, the authors sent the report of each interview and the related analyses to the interviewees in order to request confirmation about the emerged perspective from the participants and to ensure that the authors would present the perspectives of those being studied. Post-communications with the respondents helped the authors ensure the accuracy of collected data. The collected evidence was then analyzed by adopting an interpretive approach.

4. Empirical findings

4.1. Building legitimacy in the audit professional environment (RQ1)

The precipitating jolt and the emergence of disruption in audit

Regarding the seeking of legitimacy in the audit professional environment, the interviewees agree that the advent of the digital age represents what Greenwood *et al.* (2002) define as a *"precipitating jolt,"* as it is able to destabilize the established audit approach based on sampling, manual controls, and paper-based work. The more the auditees are well conversant with the analysis of vast volumes of digital data also in accounting processes, the more the auditors believe that a traditional approach to financial statements audit becomes outdated, as auditors lose the opportunity to enhance the appropriateness of audit evidence and reduce audit risk.

> "When we can access millions of data in and outside our customers' IT system, we can gain new and more evidential matters and have more chances to identify accounting irregularities; however, to do so we must have the right tools and these tools open the door to BDA, skills, and competencies […] and these, in turn, open the door to rethink the candidate profile in our recruitment policy" [P4].

The impact of such a precipitating jolt is not limited to the audit approach but involves different audit firm processes, such as the employee recruitment process with an increase in the request for data science specialists, as well the staff training process and the internal tools and procedures to carry out the audit engagement.

The deinstitutionalization stage: introducing the possibility of change

Our interviewees are aware of the potentialities that Big Data offers to enhance the audit quality and they take initiative to turn this potential into reality. Practitioners working for the Big Four indicate that Big Data and Artificial Intelligence (AI) introduce new ideas for performing audit engagements and these ideas stimulate innovations in audit methodologies and techniques. During the interviews, the practitioners point out that their headquarters currently invest heavily to develop BDA techniques and other forms of AI, often in cooperation with leading data science companies, to provide a better-quality audit.

> "Our company currently invests in the development and in the acquisition of BDA tools in order to process billions of data and see in this data what human cannot. BDA tools that test the journal entries already run in the audit processes, while a few others, such as those to analyze patterns in data, are still at the early stage of the field trial and are under scrutiny […]" [P7]

The respondents of the non-Big Four audit firms also indicated that their headquarters started projects to develop Big Data processing techniques; however, one of these respondents indicated that, generally, the Big Four lead the innovation in the audit industry and that this is the case also for BDA. These investments in new techniques favor a *de-institutionalization* of the existing audit approach and tools (stage II of Greenwood et al.'s (2002) model).

The pre-institutionalization stage and the development of independent innovations

The interviewees of the Big Four indicate that BDA tools are not used to replace the traditional audit techniques but as a complementary source of audit evidence. They also believe that in the next future BDA will not completely de-institutionalize traditional audit tools and that a major challenge for the audit profession is to define how to combine BDA with traditional tools.

> "Currently, we use BDA technology in both planning and interim phases […]. Substantially, there is not any new source of evidential matters, but analytics permit to process the same datasets we used before without suffering for sampling limits, and at a faster rate" [P3].
>
> "…We use unstructured data, too. But it depends on the evidence collected via traditional procedures. When ordinary procedures signal a high risk of fraud, for example, we collect data from multiple IT sources, such as mobiles, mail servers, hard disks, and the like. This data is then analyzed with discovery tools" [SM3].
>
> "Audit procedures are applied to the whole population of transactions related to a specific phenomenon or financial statement item with the objective of identifying those items that do not fit with expected standards, i.e. the purported outliers. The purpose of the analysis, therefore, is no longer that of identifying errors within a sample but to analyze the outliers discovered by means of BDA techniques" [SM6].

Since audit companies have recognized the possibility to complement traditional audit techniques with BDA, they have started to use BDA tools in conducting the financial audit engagements. These actions correspond to the *pre-institutionalization* stage of Greenwood et al.'s (2002) model. Results from our interviews indicate differences between the Big Four and the non-

Big Four audit firms regarding the utilization of BDA in the audit engagements. Big Four auditors point out that they currently experience the utilization of BDA in an increasing number of audit engagements to enhance different phases of the audit process: engagement planning, internal control system analysis, fraud detection, and substantive analytical procedures.

The theorization stage: building legitimacy for BDA in the audit professional environment

The participant auditors from three out of four non-Big Four audit firms indicate that they have not previously used the BDA techniques, mostly because of the low digital maturity of their usual clients, which are mainly small and medium organizations. These organizations often have very basic IT systems that rarely produce data in a usable format for BDA. In such a scenario, auditors struggle to figure out how the utilization of BDA can benefit their daily activity. The following comment expressed by the senior manager of a small audit firm helps in capturing this sentiment:

> "I am sure that Big Data analysis is the future of audit, but … I mean … it is not so imminent. Our average client cannot support the use of advanced tools for data analysis. In most cases, small firms do not even give us data in digital formats" [SM4].

The Big Four interviewees indicate that BDA tools give them the opportunity to enhance the identification and assessment of the risk of material misstatements during the engagement planning.

> "Planning the audit by means of descriptive analytics gives more depth to our analyses of a company's transactions than the depth we can reach with other and, let me say, traditional analytical procedures […]. We can extend comparisons between financial and operational information to see if historical relationships continue into the period under review […]. This helps us identify the riskiest areas, as we can easily discover unusual trends and inconsistencies between financial statements items […]" [SM1].

Big Four auditors also utilize BDA tools to perform the assessment of company's accounting internal control systems in order to establish the degree of reliance on auditee's internal procedures. A few interviewees indicate that the widespread use of ERP systems offers the opportunity to utilize process mining techniques to better perform walkthrough tests.

> "We use a process mining tool to match the documents of accounting payable and of the accounting receivable processes to identify anomalies, missing documents, and other inconsistencies in order to test the functioning of the company's internal control system and assess its reliability" [SM2].

BDA also contributes to enhance the auditors' fraud detection ability, as these techniques allow auditors to test journal entries or to compare accounting data with non-financial information retrieved from both internal and external datasets. In this manner, auditors increase their ability to detect overstatement of revenues, misstatement of expenses, and other misstatements in accounting information. The following comments support this opinion:

> "We use data analytics tools to perform the journal entry testing in order to identify unusual or seldom-used accounts. In this manner, we can overcome the limitation of sampling method, as we run our test over 100% of the transactions" [SM2].

> "We had an engagement where the client accounted for revenues derived from the use of a photovoltaic system. The team decided to compare the company's calculations with the results obtained by applying an expectation model that uses information about the weather to estimate revenues and detect a potential overstatement" [SM7].

BDA is also utilized to improve substantive analytical procedures. Participants indicate that BDA offers the opportunity to gather and analyze different types of data: financial and non-financial, internal and external, structured and unstructured in order to test the reliability of financial statements items more efficiently and effectively.

The collected evidence reveals that audit firms act to create consensus around the functional superiority of BDA when compared to traditional audit techniques by demonstrating within the audit profession that these innovative techniques provide better solutions to the auditor's needs. This corresponds to the *theorization stage* (stage IV) of Greenwood et al.'s (2002) model in which the pragmatic legitimacy of an innovation is constructed.

Audit firms have developed training courses to establish the pragmatic legitimacy. Education and training allow auditors to properly understand how to use such techniques in their work and what outcomes they produce, thus demonstrating that BDA is an approach for "doing things differently (and more effectively) than before" (Power, 2003) and a useful means to overcome issues that have emerged over time in the audit field (Tolbert and Zucker, 1996, p. 183).

> "Our audit company has launched training programs on BDA-based tools, specifically designed according to the different specialization of the auditors (IT auditors, forensic, etc.). Training is a mandatory step when you want to introduce any new practice" [SM1].

Training courses are organized with different modalities among the analyzed audit firms. While the Big Four decided to involve all the employees both at a global and a national level in the BDA training activities because they use these technologies in an increasing number of audit engagements, smaller audit firms in Italy have organized training activities only for a selected number of audit staff members. One of the interviewees from a small audit firm indicates a possible explanation for this difference by underlining that:

> "… just a few of us need this kind of skills because currently we can apply BDA only to a small number of our clients … I think that in the future, a growing number of staff members will be specialized, as we can expect to apply BDA in other engagements" [SM8].

Interviews indicate that the construction of pragmatic legitimacy around BDA in the audit profession is still an uncompleted stage because while certain auditors believe that BDA constitutes a valid source for additional audit evidence, others see obstacles to its introduction in the audit toolkit. Among these obstacles, two auditors have underlined that the shift from an approach based on sampling, which is recognized in the audit standards and already accepted and legitimized in the professional community, to the analysis of whole populations by means of BDA can bring about a misconception about auditor duties and responsibilities by creating an impression with the public that auditors can check 100% of company's transactions and financial statements items and assertions. Particularly, these interviewees have reported an opinion of their audit firm's legal department according to which the utilization of BDA can create the above-mentioned misconception and bring about an increase in audit liabilities if judges expect more from auditors but auditors cannot justify their failure to detect errors and frauds by invoking the sampling risk, which is the risk that auditors' conclusions based on a sample can be different from the conclusion following an analysis of the entire population.

> "When the public hears that auditors can test 100% of transactions by utilizing BDA, they may become convinced that auditors can provide an absolute level of

assurance of the company's financial statements and form false expectations about what the auditor can deliver to them. 100% of transactions … and the suppression of sample limits … as well as the possibility of using analytics to check the reasonableness of assumptions can create a biased representation of the assurance level the auditors can provide" [P4].

Put differently, the uncertainty regarding how the utilization of BDA would be adjudicated in the event of litigation may favor a prudential behavior among auditors in recognizing the pragmatic legitimacy of BDA and slow down its diffusion.

Moreover, four interviewees have expressed concerns about the reliability, or veracity, of information retrieved by applying BDA technologies (Appelbaum, 2016) that need to be fixed to enable the utilization of these techniques.

"Any dataset must be validated if we intend to employ it within the audit procedures … we have a protocol for that. If we interpret Big Data in the sense of external-sourced and unstructured data, we cannot apply the usual validation process; therefore, we cannot involve such data in the audit process unless we accept—and we do not—an impairment of the audit results' reliability" [SM9].

"Nobody tells you that you cannot use external-sourced data, such as social networks, sensors, and the like, to give a stronger support to the audit, but in my opinion they should be nothing more than a support. We should pay close attention to the reliability of that data as well as the reliability of the sources from which data is extracted. Without such reliability requisites, it would be very risky to embed that kind of data in the audit domain. Any step forward regarding the utilization of Big Data, AI, and other similar things must be explicitly authorized and accepted by all our counterparts, such as—first of all—regulators but also standard setters and the client themselves" [P3].

Despite concerns about data reliability, most of the interviewees—12 out of 16—show a positive mindset when asked whether the utilization of BDA would ever be considered as a weighty source of audit evidence:

"I do not think that veracity issues would always constrain BDA's plain adoption in the audit practice. Exactly the same concerns emerged when auditors were called to action in demonstrating the reliability of ERP, and such concerns have been solved. I am quite sure that the current developments in technology will provide us with the ability to validate this kind of data sources too" [SM1].

"The ability to gather new types of data from datasets other than transactional ones does not impair the data's appropriateness as audit evidence at all! When you collect unstructured data, its appropriateness is granted by the extraction process in itself. You cannot perform traditional validation protocols for extracted data … therefore ...? When you can collect the original data from a certain database and nobody can manipulate it, neither the auditor nor the client, BDA ensures that you obtain an incontestable source of evidence" [P7].

> "When you receive information from the client, whether digital data or paper-based documents, you must ensure the information's accuracy and completeness, otherwise they will not be considered appropriate as audit evidence. This is not exactly the case with BDA because data is extracted directly from the underlying databases and there is virtually no risk of manipulation" [SM5].

4.2. Building legitimacy outside the audit profession (RQ2)

The diffusion and institutionalization of BDA techniques, which correspond to the final stages (V and VI) of the Greenwood *et al.*'s (2002) model, depend on the ability of auditors to seek legitimacy for the new techniques outside the audit profession. Consistent with O'Dwyer *et al.* (2011), we split the external world of audit into two categories—clients and non-clients—and examine the actions auditors undertake to build legitimacy in these two areas.

Legitimacy with Audit Clients

To diffuse and institutionalize BDA in their relationships with auditees, auditors should preliminarily persuade clients of the *pragmatic legitimacy* of BDA by demonstrating to them that these new techniques provide better responses to the clients' interests.

Our findings show that there are many audit clients who are not interested in which techniques auditors use to accomplish their engagement, as they think that BDA is a matter of an internal arrangement of the audit firm.

> "When we submit a proposal to a potential client, we always outline our methodologies, approach, and tools including the utilization of BDA … But speaking frankly, the client focuses on the final page of the proposal letter …, as the price is the main criterion for the auditor selection … The rest is all up to us" [P1].

> "The weight that companies assign to the audit fees has dramatically increased over time […] There are a few differences among customers […] but my experience is that the audit fee counts almost 90% in the auditor selection and this percentage grows up to 99% in case of medium enterprises" [P5].

Since many audit clients are mainly interested in reducing audit fees, auditors are encouraged to adopt BDA, thereby replacing the manual audit techniques, to enhance audit efficiency by reducing the time required to analyze company's financial data and documents.

> "Our customers ask us to reduce the fee levels because they perceive our services as a commodity! This has initiated a competition based on cutting costs and working hours. This shifts the war among professionals from the audit fee per se to the type of work that auditors can actually do with such reduced costs" [P2].

The little importance the audit clients attribute to the type of techniques the auditors use during their work indicates that clients are probably not the main force to leverage in order to favor the diffusion of BDA. Sometimes clients are considered more as an opponent than an ally for the introduction of BDA. Six out of 16 auditors express this opinion. The major concern of these interviewees refers to the non-collaborative behavior of certain clients who are reluctant to give auditors access to those data that are sensitive for their business. While auditors readily access information included in the general ledger and other financial information that auditors traditionally request during the audit engagement, managers are less willing to share non-financial information regarding their customers, products, and employees with auditors.

> "In a manufacturing company, one customer has not given us permission to access the data registered by the sensor that we need to apply our process analytics tool" [SM3].

Another main issue that leads to configure auditees as opponents of audit innovation legitimacy relates to concerns about privacy and security of the data extracted and accessed by the auditors, as one of the respondents effectively pointed out:

> "The phenomenon of BDA necessarily involves problems related to the need for ensuring the privacy and the security of clients' data. Before using any external data, we need to reach proper agreements with the client. What will happen if the auditor uses a client's data for benchmarking other competitors or vice versa? A number of auditees strongly contest this practice and we would risk losing the client" [SM5].

Another interviewee highlighted that certain clients are reluctant to follow auditors' suggestions to improve their IT system in order to produce data in a usable format for data analysis when the improvement requires time and costs that are not offset by the perceived benefits.

> "Often in medium-sized enterprises and in family-based firms the client's IT system requires substantive improvements to make data suitable for advanced analyses …When we discuss this issue with the client, this suggestion might be perceived as an extra cost for their profit and loss (P&L) statements not compensated by benefits and this would threaten our relationship with the client" [SM4].

These considerations indicate that the behavior of audit clients who are generally uninterested in the audit methodologies or who oppose the utilization of BDA is the main resistance force the auditors have to manage for the diffusion and the institutionalization of BDA.

In order to overcome this resistance, auditors have adopted a selection strategy according to which BDA is utilized in financial audit engagements with clients having a higher degree of digital maturity, i.e. clients with well-established ERP systems and clients who use Big Data in their financial processes and who are familiar with data analytics techniques. In these situations, the utilization of BDA prevents clients from perceiving the auditor's toolkit inadequate and preserve the audit firm's reputation. Moreover, auditors have greater opportunities to support their clients with recommendations to improve the adequacy of financial processes and related internal control systems.

> "The utilization of process mining techniques in the financial audit engagement of company A gives us the opportunity to show the CFO and the internal audit function the potentiality this technique has to carry out a walkthrough test of transactional processes … we have discussed with them how to utilize process mining in order to check accounting payable and how to apply this to accounting receivable … After that, they started implementing these tools regularly in their internal control systems" [P1].

Three interviewees used descriptive analytics and visualization tools to improve the communication of audit findings to the CFO, the CEO, and the Board of Statutory Auditors.

> "[BDA] contributes to improve our relationship with the clients. Modern technologies provide us with the opportunity to issue more appealing, intelligible reports to the client. This has a twofold impact on the audit engagement … the results of the analyses conducted by means of BDA can bring out useful information for the client itself but, more importantly, the opportunity to present the results of the analyses in a dynamic and intelligible fashion facilitates auditees' understanding of auditors' tasks, role, and scope of their procedures" [P7].

Other allies of external auditors are those in the audited firms charged with governance. Three audit partners indicate a link between the utilization of BDA and the level of trust that the company's internal control bodies[2] place on external auditors' work.

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[2] The internal control bodies in Italy comprises the Board of Statutory Auditors and the Internal Committee established to comply with Law no. 231. The Board of Statutory Auditors is appointed by the Shareholders' meeting and its main tasks are: assessing the compliance with law; checking the adequacy of company's organizational structure and internal control system and supervise the audit of the annual financial statements. The Internal Committee established to comply

> "The BDA techniques give us the opportunity to provide to the companies' internal control bodies greater assurance that the internal control systems operate effectively" [P2].

Interestingly, one audit partner mentioned as a potentiality he perceives for the near future that the utilization of BDA techniques will help enhance the quality of how key audit matters are communicated to the external stakeholders, supporting auditors in producing more informative reports. This can be a stimulating avenue to enhance auditors' legitimacy in the external environment as underlined also in the study conducted by Appelbaum *et al.* (2017).

In sum, auditors are still in the midst of the process of building legitimacy for BDA with their clients. In this process, fee pressure and the majority of the auditees' very basic digital readiness act as resistance forces to the legitimation of BDA in auditing. The establishment of pragmatic legitimacy around BDA with auditees thus requires an increase in the average clients' digital maturity such that auditors can theorize and explicate the value-adding capabilities of such innovative techniques.

Legitimacy with Non-clients

To diffuse and institutionalize BDA in their relationships with other external parties—i.e. financial statements users, regulators, standard setters, and oversight bodies—auditors should develop the *moral legitimacy* of BDA, which means that these techniques are perceived as sound procedures able to achieve socially valued results (O'Dwyer *et al.*, 2011).

Regarding the behavior of Italian audit regulators and standard setters concerning BDA, the opinions of our interviewees are mixed. The majority of our participants—nine out of 16—indicate that the audit standards failing to explicitly recognize the utilization of BDA in audit engagements slows down the diffusion and institutionalization of this technique.

> "As long as we continue to use accounting information stored in the company's ERP, we stay safe in that we comply with audit standards. When we use external unstructured data, such as information in social networks or sentiment analyses, we

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with Law no. 231 is appointed by the company's Board of Directors and its main task consist in checking the application of internal controls to prevent corruption, false financial statements and other illegal acts.

are not sure that we are in the boundaries defined by the auditing standards because
these standards do not explicitly consider what kind of external data we can use"
[P6].

The main risk the interviewees perceive is that the utilization of external unstructured data as a source of audit evidence can expose the audit firm to litigation if these data are not accurate. A couple of interviewees indicated that the lawyer's department of their audit firm has highlighted that, due to the vagueness of auditing standards, BDA usage as unique source of audit evidence must be excluded, as it will increase the audit firm's exposure to litigation risks.

Differently, three interviewees believe that auditing standards are not an impediment to the utilization of BDA, as the auditing standards are flexible enough to encourage the utilization of new technologies that enable auditors to keep pace with the digital revolution surrounding the audit environment. The following interview excerpt further illustrates this point:

"The International Standard on Auditing (ISA) already envisages the use of
technology … think about the computer assisted audit techniques (CAATs).
Therefore, BDA is utilized in exactly the same setting. I think that a bit of further
development is needed in the standards' domain, even just because BDA
technology advances faster and faster. However, at the moment there is no need to
provide any dedicated standards, at least not while the utilization of BDA is still so
localized" [P4].

One of these three interviewees further points out that the introduction of new techniques in auditing should precede the issuance of a dedicated standard, since standards usually follow and codify existing practices. In this respect, she indicates:

"If we consider the issuance of audit standards, this generally lags behind the
evolution of audit practice. This is also the case with BDA and AI … We need to
continuously innovate our practice, as we are convinced that innovations ensure
better audit quality … the standards will follow … the absence of a standard cannot
be an excuse for avoiding innovation" [SM7].

The absence of an explicit recognition by the audit standards may also influence the moral legitimation of BDA by the auditing supervisory authorities in Italy, i.e. Consob and the Ministry of Economy and Finance. Our Big Four interviewees indicate that it is not clear how Consob will evaluate the utilization of BDA in terms of its ability to enhance the audit quality. A negative view regarding BDA emerges from reading the transcription of a speech made at a public conference by

one of the Consob representatives (Martinelli, 2019), as the utilization of these techniques can reduce the auditors' skepticism and the quality of the audit engagement.

> "The utilization of audit tools based on data analytics can decrease the auditor's degree of critical analysis in the risk assessment phase and the number of hours spent, with potential negative impacts on quality".

Summarizing, the collected evidence suggests that the process of building legitimacy around BDA outside the audit profession is still in its early stage in Italy. Specifically, the absence of a clear recognition by the audit standards and the non-supportive position of the Italian audit supervisory authority hinder the moral legitimation of BDA techniques.

5. Discussion

This study's main objective derives from the evidence that BDA techniques are not as widespread in auditing practice as they are expected to be, given their potential for improving the efficiency and the quality of financial auditing activities in the Big Data era (Alles, 2015; Dai and Vasarhelyi, 2016). We believe that this absence of BDA techniques in auditing practice is largely due to a scarcity of legitimacy that BDA techniques have both internally and externally in the financial audit professional environment. Thus, we have investigated the legitimacy production process of BDA techniques in Italy and the actions auditors currently undertake to diffuse and institutionalize such techniques.

The adopted interpretive framework (Greenwood *et al.*, 2002) identifies four different stages through which legitimacy is sought within the audit professional environment. In the *first stage,* i.e. the *precipitating jolt*, professionals must recognize the advent of a disruptive event, which stimulates the introduction of new ideas that de-institutionalize established practices and approaches. Our results show auditors unanimously recognize that BDA represent a technological disruption for the audit profession and that audit firms currently innovate audit methodologies to take advantage of the opportunities BDA offer to enhance the audit process. This innovation

follows a top-down approach, originating from the U.S. headquarters of audit firms and distributed among national offices and audit teams (Lenz and James, 2007).

In *the second stage* (*deinstitutionalization*) and in the *third stage* (*pre-institutionalization*), actors within the field start introducing independent innovations to solve locally perceived problems. In this respect, our study highlights that Italian audit firms have started using BDA techniques in different phases of their financial audit engagement to complement rather than to replace traditional audit procedures (e.g. engagement planning, fraud detection, and substantive analytical procedures). Our results show differences regarding the use of BDA between the Big Four and other audit firms, with the Big Four assuming a leading role in the usage of BDA when they perform financial statement audits for large customers who have IT accounting systems that provide high-quality data the auditor can easily process with BDA. Our results confirm prior studies' findings (Yoon *et al.*, 2015) indicating that when the majority of the audit clients are medium enterprises or family firms that tend to invest less in information technology (IT) systems and data analytics (DA) in accounting processes (Coleman *et al.*, 2016), this prevents the audit teams from using BDA in their audit engagements as in the case of the non-Big four in Italy. This result indicates that the deinstitutionalization of existing techniques and the pre-institutionalization of BDA require that the new BDA-based methodology based on BDA, introduced by the headquarters of audit companies following a top-down approach, fits the audit operating environments to ensure that the local audit team actually uses the new methodology (Fischer, 1996; Khalifa *et al.*, 2007).

During the *theorization* stage (the fourth *stage*), practitioners proceed to build the pragmatic legitimacy around the new practice so that its validity in performing the audit work becomes fully recognized within the practitioners' professional environment. Our results show that several factors slow down the BDA theorization stage, such as the clients' and audit firm's digital maturity, the reliability of Big Data, and the expectation gap. As indicated above, when the digital maturity of auditees is high, auditors in Italy currently utilize BDA techniques to complement traditional audit

practices. As long as many Italian medium enterprises and family firms still have lots of paper-based audit evidence and are not familiar with the use of Big Data, this would impair the pragmatic legitimacy of BDA. The pragmatic legitimation of BDA is also relaxed when auditors cannot appreciate the reliability of the non-financial, external, and unstructured data that they can use to confirm financial statement information in the specific audit engagement. These results underline that among the 5Vs characterizing Big Data—i.e. volume, velocity, variety, veracity, and value—veracity is the most significant to legitimate BDA as a reliable source of evidential matters. Lastly, an interesting result is that the utilization of BDA can increase the audit expectation gap. The overcoming of sampling limitations and the testing of 100% of transactions can lead the public—and especially judges in the event of litigation—to misunderstand auditors' duties and responsibilities and to expect that auditors can guarantee an absolute level of assurance on the clients' financial statements. Legal departments of audit firms are particularly concerned about this issue that can have a negative impact on auditors' legal liabilities.

The pragmatic legitimacy of BDA is also influenced by the audit firm's digital maturity. In this respect, our findings show that all audit firms in Italy currently provide BDA training programs with different approaches between the Big Four and the non-Big Four audit firms. Since the environment in which the Big Four operates, i.e. clients with higher digital maturity, favors the utilization of BDA, the training programs involve all the staff members, while in the case of non-Big Four audit firms the provision of training only considers audit partners and the audit firms' IT department.

The adopted interpretive framework identifies *two further stages*, namely *diffusion and re-institutionalization*, through which auditors seek legitimacy in the external world of audit, which comprises both audit clients and non-clients. During these stages, practitioners must convince external parties that the new practice is legitimate, as it is able to fulfil their needs and expectations. Our results indicate that the process of constructing legitimacy around BDA with both clients and non-clients is still in its early stages.

Audit clients do not favor establishing pragmatic legitimacy of BDA for two reasons. First, the majority of clients pay more attention to the level of audit fees than to the quality of audit services and in such a scenario the utilization of BDA techniques is merely considered as an internal arrangement for the audit firm. This makes it difficult for auditors to elicit clients' consensus regarding these new techniques. Second, auditors sometimes find that clients resist the auditors' access to new non-financial data for confidentiality reasons, and this impedes the utilization of BDA. These results partially differ from the extant literature on BDA in auditing, according to which innovation appears to follow a market pull logic (Alles, 2015; Alles and Gray, 2016). Such difference may be due to the peculiarities of the Italian context, mostly characterized by medium enterprises with information systems that are not integrated and accounting functions with low digital maturity. Future research can further investigate this issue by expanding the analysis to other countries to gain a deeper understanding of how the clients' characteristics can influence the auditors' adoption of BDA and other new technologies.

In order to persuade clients about the ability of a BDA-driven audit engagement to successfully answer their needs, i.e. to establish the pragmatic legitimacy of BDA, auditors presently adopt a selection strategy, according to which BDA techniques are introduced in order to perform financial audit engagements for specific clients only—and particularly for those that show a higher digital readiness. The reason for this decision is twofold. First, in these situations, the utilization of BDA can preserve audit firm's reputation, as auditors are able to demonstrate that they can keep abreast of innovations introduced by the auditees in their financial reporting and decision-making processes. Moreover, auditors can exploit this opportunity to reinforce their relationship with their clients by supporting them with recommendations to improve the adequacy of their IT infrastructure and internal control systems.

Regarding the legitimacy-seeking process with non-clients, literature has amply highlighted that standard setters do not encourage the utilization of new techniques in financial statements auditing (Austin *et al.*, 2020; Cao *et al.*, 2015; Salijeni *et al.*, 2019). This situation is also found in

Italy, where the national audit standard setter has not issued any specific standard, regulation, or technical guide to explicitly recognize the possibility of utilizing BDA in statutory auditing. Moreover, our findings highlight that in Italy the moral legitimacy of BDA techniques is prevented by the non-supportive view of the Italian auditing supervisory authority, which has expressed concerns about the risk that the utilization of BDA techniques impairs auditors' skepticism and would result in a lower audit quality.

The absence of recognition in audit laws and in professional audit standards as well as the national audit oversight authority's non-supportive behavior can thus prevent the diffusion of BDA in Italy like in other civil law countries where, in the event of litigation, auditors' responsibilities are assessed in terms of adherence to the codified set of rules. Compared to common law countries, in civil law systems the codification of BDA in the audit regulatory environment can be more beneficial to favor the diffusion of this technique in the audit profession. Our results highlight that the legal systems' characteristics have an impact on the diffusion of audit innovation and this can be an interesting avenue for future researches. Particularly, future studies can replicate our analyses in other civil law countries or make a comparison between common and civil law systems to shed light on this issue.

6. Conclusions

The objective of this study was to analyze the process of producing legitimacy around BDA techniques in auditing, the factors fostering or hindering such process, and the action auditors take to legitimate BDA inside and outside the audit community.

The results of this study indicate that BDA legitimacy within and outside the audit profession is crucial to ensure the utilization of these techniques in performing the audit engagements. Our results underline that in Italy the legitimacy-building process is more advanced in the audit professional environment than outside the audit community (standard setters, oversight authorities, and audit clients) and that the Big Four have assumed a prominent role in innovating audit practices

through the use of BDA. The use of BDA as a complementary source of audit evidence in conducting financial statement audits for digitally mature clients progressively favor the achievement of BDA's pragmatic legitimacy within the audit profession. Outside the audit profession, the auditees' low digital maturity as well as the limited support shown by standard setters and the Italian oversight authority are the most relevant obstacles to the BDA legitimation process in auditing.

Our findings have implications for audit practice. First, the client's digital maturity influences the possibility to utilize BDA and extract the value from these techniques in terms of greater audit evidence, greater audit efficiency, and a better audit reputation. This suggests to adopt a selection strategy for the utilization of BDA in which the toolkit used by auditors should be tailored to the characteristics of the audit operational setting. Second, BDA is employed to enhance different phases of the audit process but in a manner that these techniques complement rather than replace traditional techniques, which, to date, are the only ones recognized by the Italian audit standards and audit supervisory authorities.

This study presents certain limitations. First, the interview method is particularly suitable for conducting analyses that are explorative in nature but poses relevant limitations to the conclusions' generalizability. Second, in our analysis we have interviewed only auditors operating in Italy and the Italian setting's characteristics influence the auditors' perceptions regarding the utilization of BDA. Nevertheless, as also in other countries audit clients are medium enterprises and family firms with less advanced IT systems and low investment in DA, we believe that our results can be useful to examine the legitimation process of BDA in other settings. Third, we want to stress that this study's findings mirror only the perceptions of external auditors who are one—albeit an important—actor to produce legitimacy for these techniques. It would be interesting to further investigate the perspective of other actors like regulators, standard setters, and auditees and how these actors contribute to legitimate innovative audit practices.

Our results also highlight opportunities for further research, a number of which have been indicated above. Furthermore, as our study indicates different factors impacting the BDA legitimacy production process in a single country, future research could use the insights gained from this study to build a model on the factors influencing the utilization of BDA that can be tested in a quantitative manner and in different countries. Moreover, our results, which are a first attempt to depict the current stage of BDA employment in financial audit in Italy, can stimulate further studies aimed at investigating how audit practices change in a data-driven audit environment. For example, studies can use our results to investigate the utilization of AI or machine learning in an auditing environment to examine the factors that can impede or favor their diffusion in the Big Data era.
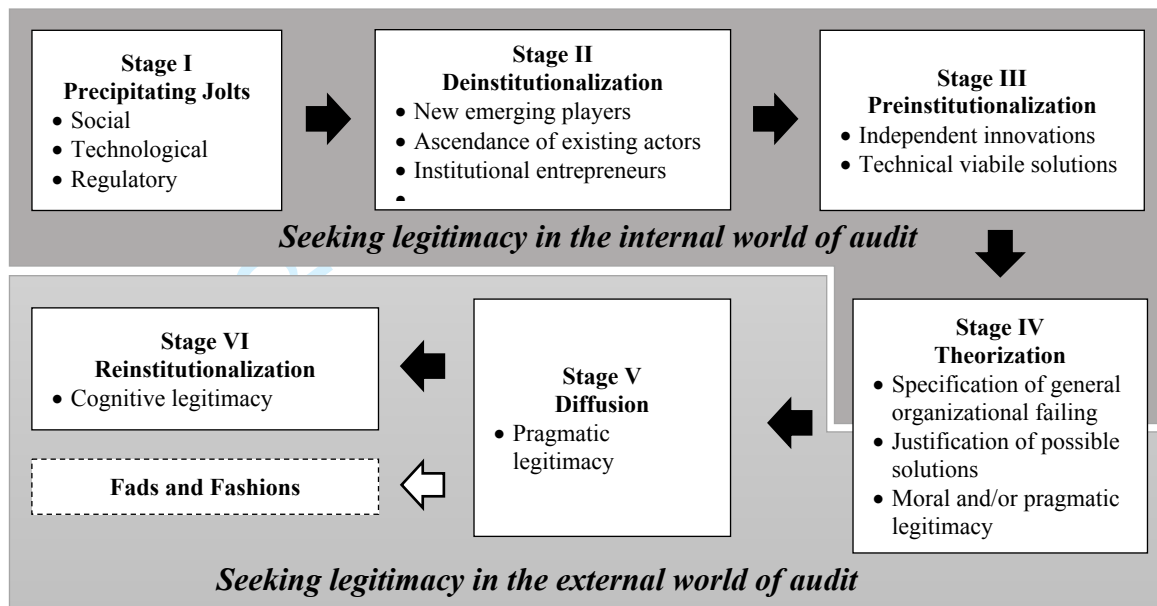
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Figure 1. The adopted interpretive framework

Stage I Precipitating Jolts	Stage II Deinstitutionalization	Stage III Preinstitutionalization
• Social	• New emerging players	• Independent innovations
• Technological	• Ascendance of existing actors	• Technical viabile solutions
• Regulatory	• Institutional entrepreneurs	

Seeking legitimacy in the internal world of audit

Stage VI Reinstitutionalization	Stage V Diffusion	Stage IV Theorization
• Cognitive legitimacy	• Pragmatic legitimacy	• Specification of general organizational failing
		• Justification of possible solutions
Fads and Fashions		• Moral and/or pragmatic legitimacy

Seeking legitimacy in the external world of audit

Source: Greenwood et al. (2002) – adapted

Table 1 – List of interviewees

Code	Organization	Role
P1	Big Four	Partner—responsible for audit innovation
P2	Big Four	Partner
P3	Big Four	Partner
P4	Big Four	Partner—responsible for audit innovation
P5	Small audit firm	Partner
P6	Small audit firm	Partner
P7	Big Four	Technology and BDA application
SM1	Big Four	Information risk manager
SM2	Mid-tier audit firm	Technology and BDA application
SM3	Big Four	IT auditor
SM4	Small audit firm	Technology and BDA application
SM5	Big Four	Information risk manager
SM6	Small audit firm	Technology and BDA application
SM7	Big Four	Technology and BDA application
SM8	Small audit firm	IT auditor
SM9	Big Four	Partner—responsible for audit innovation

Table 2 – Interviewees' information

Code	Role	Age	Gender	Certif.	N. years experience in audit	N. years in the current position	N. of audit engagements per year	Industry specialization
P1	Partner—responsible for audit innovation	51	M	CPA, CFA	22	10	15	Non-financial
P2	Partner	54	M	CPA	25	7	20	Financial
P3	Partner	57	M	CPA	25	8	30	Financial
P4	Partner—responsible for audit innovation	45	M	CPA, CFE	18	5	35	Non-financial
P5	Partner	62	M	CPA	30	15	10	Non-financial
P6	Partner	43	M	CPA	13	1	15	Non-financial
P7	Technology and BDA application	47	M	CPA,CFE	17	2	10	Financial
SM1	Information risk manager	36	M	CIA, CFE	12	3	50	Financial/Non-Financial
SM2	Technology and BDA application	41	M	CIA, CPA	13	6	15	Financial/Non-Financial
SM3	IT auditor	34	F	CFA	9	5	35	Financial/Non-Financial
SM4	Technology and BDA application	38	M	CFA, CFE	14	3	10	Non-financial
SM5	Information risk manager	32	F	CFE	7	2	25	Non-financial
SM6	Technology and BDA application	39	M	CFA	8	4	10	Financial
SM7	Technology and BDA application	29	F	CFE, CISA	5	2	20	Financial/Non-Financial
SM8	IT auditor	37	M	CISA	11	6	15	Non financial
SM9	IT auditor	35	M	CFA	10	3	5	Financial/Non-Financial

Certifications: Certified Public Accountant (CPA); Certified Financial Analyst (CFA); Certified Internal Auditor (CIA); Certified Information System Auditor (CISA); Certified Fraud Examiner (CFE)

Table 3 – Participants demographics

Role	%	Gender		Age			N. years experience in audit			N. years in the current position			N. of audit engagements per year		
		%M	%F	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.	Mean	Min.	Max.
Partner/partner responsible for audit innovation	38%	100%	0,00%	52	43	62	22	13	30	8	1	15	21	10	35
Technology and BDA application	31%	80%	20%	39	29	47	11	5	17	3	2	6	13	10	20
Information risk manager	12%	50%	50%	34	32	36	10	7	12	3	2	3	38	25	50
It auditor	19%	67%	33%	35	34	37	10	9	11	5	3	6	18	5	35
Total	**100%**	**81%**	**19%**	**43**	**29**	**62**	**15**	**5**	**30**	**5**	**1**	**15**	**20**	**5**	**50**

Appendix 1 – List of questions

1. What is your role in your firm?

2. How many years did you spend as an audit professional?

3. How many years have you been working for your current audit firm? And how many years have you been in your current work position?

4. Do you have any certifications relevant to your profession?

5. Did your firm invest in Big Data and Analytics (BDA) projects? What have been the key developments with regards to BDA in your organization in the past few years?

6. Have you been directly involved in projects related to BDA? If yes, what is your role in these projects?

7. What is your opinion about the impacts of BDA in terms of improving the quality of the audit process?

8. Are there certain specific phases—such as engagement planning, internal control systems evaluation, substantive tests—of the audit process that you think can be enhanced with the application of BDA?

9. Are you using BDA techniques to perform the audit engagement? If so, in which engagements do you apply BDA?

10. Based on your opinions, what are the most important factors favoring the utilization of BDA techniques? And what are those hindering the use of these techniques?

11. What actions have been taken to favor the use of these techniques in your organization?

12. Do you think that the utilization of BDA can improve your relationships with your clients? If yes, how? If no, why?

13. Do you currently take initiatives to promote BDA with your clients? What approach did you follow? And how was the clients' response to such approach?

14. What is your perception about audit standards and regulation regarding the use of BDA in auditing?

15. What is your perception of the Italian audit supervisory authority's behavior regarding the utilization of BDA in auditing?