BIG DATA ANALYTICS AND THE SOCIAL RELEVANCE OF AUDITING: AN EXPLORATORY STUDY

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<td>ANT</td>
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<td>BRA</td>
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<td>ERP</td>
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<td>EY</td>
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<td>FRC</td>
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<td>IAASB</td>
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<td>IDEA</td>
<td>Interactive Data Extraction and Analysis</td>
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<td>ISA</td>
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<td>MBA</td>
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<td>NIT</td>
<td>New Institutional Theory</td>
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<td>PCAOB</td>
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<td>Price Waterhouse Coopers</td>
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ABSTRACT

BIG DATA ANALYTICS AND THE SOCIAL RELEVANCE OF AUDITING: AN EXPLORATORY STUDY
George Moyenda Salijeni
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Big Four and mid-tier audit firms have made huge investments in developing and acquiring tools that are used to exploit Big Data (BD) environments. Further, audit regulatory agencies are also interested in understanding how audits in such environments are being conducted and the effects of these tools. Therefore, this thesis situates the deployment of tools to extract BD, referred to as Big Data Analytics (BDA) and their significance for the conduct of external audits. It addresses two important areas, namely the promotion of BDA in the audit field and its embedding in the audit process. The promotion of BDA in the audit field is understood through the construct of rhetorical strategies, whereas the embedding of BDA in the audit process is explored using the constructs of identity regulation and affordance. These constructs are drawn from new institutional theory and the sociomateriality perspective with the objective of understanding how BDA, as audit technology, is implicated in the social relevance of auditing. The evidence is collected from 27 semi-structured interviews with individuals dealing with BDA in the audit field and beyond, from publicly available textual data from audit firms and from observations of audit firms’ proprietary BDA tools.

The findings indicate that, in promoting BDA, audit firms are using various discursive strategies either to stimulate more public trust in auditors’ commitment to audit quality or to add value to their clients. In this regard, audit firms use teleological, ontological, historical and value-based arguments to show that BDA addresses concerns associated with audit quality. On the other hand, audit firms use cosmological arguments and arguments based on value added to show that BDA could enhance the operational efficiencies of their clients. However, the firms face challenges in relation to issues of data security and lack of understanding of the meaning of BD and the context in which BDA should be used in the audit. Further, to embed BDA, audit firms use discursive strategies aimed at ‘winning hearts and minds’ of auditors at all levels of the hierarchy within firms. This involves developing the identity of auditors as both data analysts and business advisors to the client who generate value for their firms by exploiting opportunities associated with BDA. Therefore, auditors are encouraged to show commitment to using BDA during audits through recruitment, capacity building, incentives, personal reviews and the industrialisation of BDA. Finally, BDA is implicated in the reconfiguration of data processes. Auditors argue that BDA offers affordances which enable them to achieve greater coverage in terms of operational scope and depth. Such affordances, in particular the use of visualisation tools, could have implications for their professional judgements because audit evidence can be manipulated and presented in various dimensions to clients. However, BDA constrains auditors who may not have the relevant expertise to operate some of its functionalities.

The study contributes by providing early empirical accounts of the latest and most significant developments in audit technology. Further, it adds to prior literature on changes in audit technology by highlighting that such technological transformation also requires that auditors reconsider their professional identities. This leads to a revisited focus on not only what auditors do but also who they are (need to be). Finally, in studying technological changes in audit, the research illustrates the importance not only on how auditors make use of the technology but also the properties of the technology itself (its socio-material characteristics) as a significant influence on how it is embedded and used in practice.
DECLARATION

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CHAPTER 1. INTRODUCTION

In developed economies, organisations that are subject to statutory audits (audit clients hereafter) are operating in contexts which are now characterised as Big Data (BD hereafter) environments (ACCA, 2015; ICAEW, 2016; Appelbaum et al., 2017). The advent of BD is argued to facilitate growth in economies and enhance the competitive advantage of audit clients. For example, in relation to economic growth, BD is implicated in generating £322 billion in the UK by 2020 (Centre for Economic and Business Research, 2016), while in the European Union, it is estimated that the manufacturing sector would save €425 billion (EU, 2017) by 2020 through the use of BD. With respect to competitive advantage, some clients, such as global bank Citi, have credited BD with a 15% impact on return on investment (Bartram, 2013). As a result, clients are making efforts to take advantage of BD by exploiting the potential benefits which can be derived from it. Such efforts include development of tools that are used to collect and analyse BD in order to uncover potential value, referred to as Big Data Analytics (BDA hereafter). In this context, the term BDA is meant to capture the relationship between the two terms in order to contextualise Data Analytics (DA) in BD environments. BD relates to the nature of data (Gartner, 2012), whereas DA refers to the collection of tools developed to make sense of that data. Audit clients in BDA environments are therefore involved in collecting and processing large volumes of diverse data from multiple sources at a faster rate than before (Gartner, 2012).

In addition to BDA being used to exploit opportunities associated with BD for audit clients (PwC, 2016a), there is a growing recognition that BDA and BD are affecting the way audits of clients’ financial statements are conducted. This recognition stems from the fact that auditing is essentially an information-based activity; therefore, the rise of BD and developments in BDA should potentially transform audit environments (Cao et al., 2015; ICAEW, 2016; Appelbaum et al., 2018). Relevant participants in the audit field, such as large audit firms (audit firms or firms hereafter), standard setters and regulators (regulatory agencies hereafter), and researchers have noted that a paradigm shift is required to understand, quantify and measure the economic and social impact of BDA in audit environments (PwC,
2014b; Vasarhelyi et al., 2015; IAASB, 2016a; FRC, 2017). As such, BDA has become one of the important areas of innovation in auditing (IAASB, 2016a; ICAEW, 2016; FRC, 2017) and the audit profession is showing great interest in development and implementation of BDA in audits of financial statements. For example, audit firms are making significant claims about their own developments of BDA. Such claims include highlighting their investments in either acquiring or developing BDA tools, as well as providing accounts of the potential impact of BDA on the quality of audits of financial statements (Deloitte, 2015; EY, 2015a; KPMG, 2015b; PwC, 2016a). Therefore, in this context, BDA in auditing relates to the technology that is developed and organised from the perspective of BD.

Regulatory agencies have also expressed their desire to understand the role and implications which BDA might have on audits of financial statements. Given that audit firms are introducing BDA tools into the regulated environment, regulatory agencies have established initiatives to explore the impact this might have on the quality of audits of financial statements and on existing standards in auditing. For instance, there is a working group on BDA within IAASB to assess and evaluate its impact on auditing standards (IAASB, 2014; 2016a), while the FRC has published a thematic review of BDA which illustrates areas where BDA is commonly used and how it is affecting the quality of audits (FRC, 2017). The aforementioned cases show that attempts are being made to appreciate the role of BDA in auditing. However, there is a growing recognition that this area is still developing and requires further research.

In this regard, several researchers have so far attempted to understand BDA and its effects on audits of financial statements (; Brown-Liburd et al., 2015; Cao et al., 2015; Vasarhelyi et al., 2015; Appelbaum et al., 2018). These studies provide normative accounts of BDA and its related issues by conceptually suggesting areas where BDA could be used in audits. Furthermore, they opine about how BDA might improve the efficiency and effectiveness of audits. Although most studies on BDA have not provided empirically driven accounts, they resonate with prior studies on innovations in audit technologies by highlighting how auditors should respond to or cope with technological change in their profession. In particular, BDA is portrayed in the studies as a technical development which auditors have to respond to by changing their audit practices. Further, current studies on BDA appear not to provide a
detailed account on understanding rationales and motivations for developments in BDA in the audit field.

This study recognises that the potential of BD and BDA to transform audit environments should not be assumed, as is alluded to in current studies on BDA, but rather should be investigated to uncover the dynamics of such a change and its impact on practice. This is important because it could have implications for the relevance of BDA and how it is embedded in audits of financial statements. Therefore, to address some of the shortcomings in current studies on BDA (see Table 1.1), this study provides empirical accounts of BDA in auditing by exploring the ways audit firms are promoting BDA to relevant stakeholders along with the ways they are embedding it in their audits of financial statements. The aim is to understand how technologies used in data driven environments are mobilised to maintain the social relevance of auditing.

The rest of the chapter is structured as follows: Section 1.1 provides a brief overview of BDA and technological innovations in auditing. Section 1.2 then discusses the research motivations and questions, followed by arguments for the significance of the study in Section 1.3. Finally, Section 1.4 outlines the structure of the thesis.

1.1 BDA and technological innovations in auditing

As indicated, all major audit firms (the Big Four and top mid-tier firms) have invested significantly in recent years to either acquire or develop BDA tools. For example, KPMG has stated that the firm is in collaboration with technological companies (such as the McLaren Technology Group, better known for Formula One racing) and had established a $100 million (£74.8million) investment fund aimed at developing data analytical capabilities that “add value for all [their] stakeholders by further increasing quality” (KPMG, 2014a, p. 57). Similarly, EY indicated its commitment of US$500 million to develop audit innovation, including new audit support tools involving BDA (EY, 2014). This included acquisition of companies that had advanced BDA capabilities such as Bluestone Consulting (EY, 2015b) and Society Consulting (EY, 2016b). Also, PwC announced that they have developed Halo, i.e. an in-house analytical tool, to replace previous off-the-shelf tools and to offer “a next generation software
application that analyzes and assures data using a suite of algorithms” (PwC, 2014b, p. 15). Others, in particular smaller audit firms, often make use of off-the-shelf analytics software such as Spotlight®, Lavastorm© and Alteryx© (ICAEW, 2016) to leverage their BDA capabilities.

The propensity to invest in audit technologies is not new among audit firms; historically, they have also made investments in audit technologies such as statistical sampling and Business Risk Auditing (BRA) approaches. The corollary to this is the claim that audit technologies change the way audits are approached in the field, in particular the issue of audit evidence (Matthews, 2006a). For instance, Power (1992) and Lee (1993) indicated that the audit profession has for a long time struggled with addressing the notion of what constitutes appropriate and sufficient audit evidence. Therefore, the developments in audit technologies, despite others suggesting that they are meant to address political and economic dimensions of the audit profession (Lemon et al., 2000; Robson et al., 2007), have been portrayed as a quest to address the issue of audit evidence for establishing audit opinions (Matthews, 2006b). For example, Higson (2003) noted that, from the late 1960s to the late 1970s, there was a reduction in the verification of transactions as an audit approach. The focus therefore shifted to checking the strength of the client’s internal control system under the approach called system-based auditing. In order to provide justification for the reduction in audit evidence, audit firms introduced statistical sampling to determine the amount of audit evidence (Power, 1997). Even though the use of samples instead of a full population as audit evidence predates this period (Power, 1992), the use of a mathematically driven approach in the form of statistics was regarded as a new technology in the determination of samples. Statistical sampling was therefore deemed an innovative technology that provided scientific rationality in collecting audit evidence (Carpenter and Dirsmith, 1993).

However, in the early 1980s statistical sampling was used in conjunction with other technologies in the audit process. These technologies were introduced to facilitate the same function of audit evidence collection and evaluation. The risk-based audit approach was introduced, in which the Audit Risk Model (ARM) (Holstrum and Kirtland, 1983; Power, 1997; Matthews, 2006b) was a technology providing a formulaic approach to determining the quantity and quality of audit evidence collected.
The model allowed quantification of audit evidence in terms of assessing clients’ inherent risks and control environments, and the competence of auditors to detect material financial misstatements.

Later, in the 1990s, the risk-based audit approach evolved from focusing on audit risks to focusing on business risks, whereby technologies grouped under the label Business Risk Auditing (BRA) were developed to allow auditors to focus more on the objectives and operations of the business than on transactional balances in the financial statements. BRA is based on the notion that business and financial risks co-produce each other (Robson et al., 2007). Therefore, the objective of an auditor is to identify potential areas of risk to the business and how such risks affect the assertions included in the financial statements (Lemon et al., 2000; Higson, 2003). However, the corporate collapse of Enron in 2002 brought into question the efficacy of BRA (Robson et al., 2007).

Against this backdrop, in this study, BDA is placed within the broader context of prior developments in audit technology and therefore warrants scholarly attention to understand its relevance and impact on practice. This study recognises that prior developments in audit technology, for example statistical sampling and BRA, have also been introduced accompanied by similar justifying rationale, prompting other scholars to suggest that there is more to audit technologies than just technical efficiency. These studies have provided institutional narratives of developments in audit methodology in which the focus has been on understanding the symbolic and technical roles of audit technologies. It has been argued that such technologies are used to legitimise the audit profession by portraying images of scientific rationality associated with audit expertise (Dirsmith and Carpenter, 1993; Power, 2003). Such representations of auditing are important if the profession is to overcome regulatory censure when faced with public criticism (Curtis and Turley, 2007). In this way, technological developments have a long history of helping to maintain the social relevance of auditing. This study places BDA within the broader context of such developments and explores BDA beyond its technical rationale to consider the dynamics associated with its promotion and implementation.
As indicated in prior studies, the promotion of audit technology is not unproblematic; it is faced with challenges within and outside of audit firms. Therefore, the role of audit firms is to construct plausible accounts that align audit technology to the “programmatic dimension of auditing” (Power, 1997, p. 7), such as audit quality. This may include problematising the existing technologies and offering the new audit approach as a solution for addressing or meeting the needs of the regulators and of clients. In the past, technologies have been linked to enhancement of audit quality as well as to providing value adding services to the clients’ businesses (Knechel, 2007).

In addition to the relevance of audit technologies to meeting regulatory concerns, previous studies have also shown that they are used to meet the commercial goals of audit firms themselves. For example, Knechel (2007) stated that audit firms relied on technologies such as BRA to identify areas where consultancy-type work could be carried out, potentially enhancing the revenue generated for these firms. Auditors argued that this approach improves their understanding of the client’s business and allows them to provide quality audits. However, regulators have raised doubts about the relevance of this argument, given that it involves a client perspective which could affect auditors’ independence (Robson et al., 2007). It should also be noted that, in promoting audit technologies, audit firms work with professional bodies and regulatory agencies (Robson et al., 2007). However, this working relationship does not always give the intended results. For example, the standard setters may dilute aspects of audit technology when incorporating it into auditing standards (Curtis et al., 2016), to the dissatisfaction of audit firms, reflecting the fact that standard setters do not want simply to follow an agenda set by practice firms (Bamber and McMeeking, 2016).

Despite being promoted on the basis of technical efficiency, embedding audit technology in day to day practice is also challenging. Earlier research has shown that there is a tension between audit firms’ administrators and practitioners because they have different motives. Administrators are interested in audit technology so that audits are perceived as credible by the clients and regulators (Curtis and Turley, 2007). In other words, they are interested in the image of auditing projected to the outside world (Fischer and Dirsmith, 1995), so that the firm is able to achieve technical and commercial goals. On the other hand, practitioners are concerned with audit quality, litigation risk and their reputation if an audit fails (Power, 2003).
Practitioners may also resist any attempt to commodify the audit process through technologies or structured approaches to auditing because their concept of “professional judgement” is deemed to be at risk. In this regard, structured audit technologies may be regarded as having an influence on deskilling the audit profession (Fischer, 1996; Curtis and Turley, 2007). Considered together, the processes of change in audit methodology are not simply about “passive” technology but are rather about actively shaping, or being shaped by, audit practice. Robson et al. (2007) demonstrate that audit technologies transform the market for audits by shaping the role and image of auditors to take into account the goals of audit firms.

1.2 Research motivations and questions

The motivation for undertaking a study of BDA in the context of auditing is linked to the high degree of attention on this issue, both within the audit profession and from other groups in the audit field. Relevant stakeholders, such as regulatory agencies, audit firms, professional associations and researchers, have made declarations on BDA in a variety of ways. Apart from making significant investments in BDA and promoting it in public documentation, audit firms have also carried out self-reported research on their clients, in the form of surveys, to highlight the relevance and impact of BDA in audits of financial statements and other aspects of clients’ businesses (KPMG, 2014b; PwC, 2016b). Regulatory agencies and professional bodies have also taken a similar approach by producing several evidence-based reports on the implications of BDA for the profession. These reports provide insights into technical debates taking place on BDA (IAASB, 2016a and b; ICAEW, 2016; FRC, 2017).

The existing literature on BDA indicates that, for a long time, audit firms have been using analytical tools in audits in some form on a smaller scale. However, changes to the regulation of audits, including requirements for more frequent competitive tendering of audits, along with technological advancement within client businesses, which includes the prevalence of data warehouses and enterprise resource planning systems (ERPs), have made BDA a relevant technology for winning and conducting audits (Cao et al., 2015). The literature also argues that BDA has the potential to improve technical efficiency in audits by enhancing the quality of both the evidence that auditors collect and their professional judgements based on that
evidence. BDA is also allowing auditors to provide insights to clients on their operational efficiency. Such normative arguments for BDA have also been reproduced in the official documents and presentations of audit firms and standard setters (Cao et al., 2015; IAASB, 2016a).

However, the distinction between the research conducted by the audit profession (audit firms, regulators, standard setters and professional associations) and by academics is that the latter is largely conceptual, thereby providing mainly normative arguments in three areas, namely BD, BDA and auditors. As a result, there is a deficiency of empirical academic research on the use of BDA in audits of financial statements at the audit firm level. This study intends to address this deficiency by proving the empirical accounts of BDA at the audit firm level. In doing so, the research complements the current body of conceptual work on BDA through a study that develops and answers research questions based on the deficiencies in the extant studies on BDA in auditing. Therefore, Table 1.1 provides a summary of the studies on BDA in auditing in order to show the areas which have been addressed so far. The aim is to highlight areas which have potential for further exploration.
**Table 1.1 Motivations for the study based on the gaps in the current BDA studies**

<table>
<thead>
<tr>
<th>Categories</th>
<th>Big Data</th>
<th>Big Data Analytics</th>
<th>Auditors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Broad research question(s)</strong></td>
<td>What audit evidence could be derived from BD?</td>
<td>What are the areas in the audit process where BDA should be used for?</td>
<td>What attributes should auditors have to conduct an audit in a data driven environment?</td>
</tr>
<tr>
<td></td>
<td>How can audit evidence from BDA be improved?</td>
<td>How is BDA enhancing the conduct of audits of financial statements?</td>
<td>What opportunities and challenges affect the auditors in using BD and BDA?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appelbaum et al. (2017, 2018).</td>
<td></td>
</tr>
<tr>
<td><strong>Key arguments</strong></td>
<td>Studies intend to suggest new forms of audit evidence which could be</td>
<td>Studies argue that the audit profession could draw on BDA tools from other fields,</td>
<td>Studies suggest that BD could affect the cognitive ability of auditors.</td>
</tr>
<tr>
<td></td>
<td>exploited from the BD environments.</td>
<td>such as Business and Forensic Accounting. Such tools could be customised to the</td>
<td>Such is the case because the amount of information available for processing is so overwhelming</td>
</tr>
<tr>
<td></td>
<td>These studies attempt to conceptualise ways in which BD could either</td>
<td>audit process to enhance the quality of audits.</td>
<td></td>
</tr>
</tbody>
</table>

19
Researchers assume that BDA could enhance the sufficiency and quality of audit evidence. The studies take the techno-rational approach because they suggest ways in which BDA could optimally improve the audit process. Studies of this nature depict BDA as an answering machine for the problems which auditors face during audits. They also argue that BDA tools have technical advantages over existing audit technologies in terms of evidence collection and processing, such as statistical sampling. Further, the use of BDA could be affected by auditors’ lack of technical skills. However, these studies argue that auditors have competences in analysing large volumes of financial information which could leverage their deficiency in BDA’s technical skills.

| Key findings | Studies conceptualise that unstructured data in the form of social media, emails and video footage from CCTV, just to name a few, could be BDA could enhance the audit process by reducing the amount of time spent on an audit. | Mixed normative views on whether the regulatory environment, especially the standards setters, should |
| **Shortcomings/gaps** | The current studies, while identifying what could be regarded as audit evidence, have not explored the process of legitimising BD as audit evidence.
These studies assume that audit evidence is out there requiring auditors to find it. | Developments in audit technologies are regarded as neutral, linear and incremental.
Studies have not addressed the way BDA is promoted and accepted within the audit field.
These studies only focus on the technical role of BDA, ignoring BDA’s symbolic role in the audit field. | Studies fail to recognise that the use of technology goes beyond the retraining of auditors to include their perceptions on the benefits associated with the technology.
These studies do not recognise the roles which other key stakeholders (data analysts) play in shaping audits of financial statements. |
It is not yet clear how competing professional and business rationalities are reconciled in the process of promoting and embedding BDA in the audits of financial statements. BDA are only regarded as rationalistic models of the audit process aimed at helping auditors reach professional judgements based on factual and objective means. While this is fruitful, it ignores the interplay that takes place between BDA and auditors in shaping the audit process and expertise.

Studies offer very little knowledge on how audit firms are encouraging the use of BDA in audits of financial statements.

| What do prior empirical studies on audit technology say in this context? | Evidence has to be socially and institutionally accepted within the knowledge base of auditing to be regarded as legitimate audit evidence (Humphrey and Moizer, 1990; Curtis and Turley, 2007). | The audit environment is conflict-laden because of competing rationalities which means that introduction of technologies would be freely accepted (Fischer, 1996). | The introduction of audit technology is not guaranteed to be embedded in the audit function (Fischer, 1996) and auditing standards (Curtis et al., 2017), highlighting the |
Technological change also affects the way auditors see themselves (Robson et al., 2007).

Technologies and auditors co-produce each other (Curtis and Turley, 2007).

Retraining in auditing is about more than equipping auditing with the competence and technical skills, but also about the reconceptualisation of their identities (Robson et al., 2007).
Research questions

It is clear that evidential understanding of BDA is restricted to technical reports and self-reported research produced by the audit profession, since the academic literature on the issue is largely conceptual. Further, these conceptual studies offer a narrow view of BDA through compartmentalisation into the silos of BD, BDA and auditors. This study, therefore, is built on the motivations and shortcomings identified in Table 1.1 to provide a holistic view of developments in BDA and auditing according to three issues, namely the means of legitimising BDA, promotion of BDA at the audit firm level, and the effects of the interplay between auditors and technology when BDA is embedded in actual audit practice. These issues form the basis of three research questions in this study.

First, from the current studies on BDA and BD, there is limited knowledge of what is being said about BDA to clients and other stakeholders, such as regulators, in terms of a process of persuading them that BDA is relevant for audit purposes. This points to the process of legitimising BDA as a tool that could address regulatory concerns relating to audit quality and inferential problems of audit evidence. Prior studies have provided accounts of how audit technologies are legitimised by showing that their use provides credible audits and that they would change the way audits are delivered (Matthews, 2006a; Robson et al., 2007), but the developments in BDA have not been analysed in this way. Therefore, research question 1 is:

What are the strategies audit firms employ to promote the relevance of BDA to relevant stakeholders?

Second, the current literature on BDA assumes that its embedding in the audit function is less challenging. However, there is evidence that technological change entails a questioning of auditors’ relevance and competences (Fischer, 1996; Knechel, 2007). This observation points to the dynamics associated with technological change in terms of how auditors conceptualise it and its challenges. Prior literature (Curtis and Turley, 2007; Robson et al., 2007) documents challenges in embedding new audit technologies in the conduct of an audit, alluding to the possibility that such changes not only entail the revisiting of auditors’ practical approaches to auditing but also of the more fundamental issues relating to their professional “selves”. Therefore, the change in audit methodologies should also be viewed as a change in audit
identity and any attempt to embed a technology such as BDA in firms’ methodologies requires the revisiting of auditors’ professional roles and identities. In this regard, the second research question is:

**What means do audit firms use to promote the use of BDA in the conduct of the audit?**

Third, current research indicates that BDA could impact the audit process. Previous studies acknowledge this point and demonstrate that changes in audit technology have an impact on both the audit process and practice (Power, 1997; Matthews, 2006b; Robson et al., 2007), in particular on how auditors respond to technological change and the challenges associated with new prescriptions for that process. Thus, these studies have dealt with the way audit firms’ administrators are promoting and embedding audit technologies (Fischer, 1996; Robson et al., 2007), as well as with how practitioners respond to administrators’ intentions (Curtis and Turley, 2007). The drawback of these studies is that they have ignored the role of properties of audit technologies by treating them as given. These properties influence what auditors can do in the first place and what changes can be achieved through BDA. Therefore, the third research question is:

**How do particular properties of BDA impact on the conduct of the audit in a multidisciplinary firm?**

The three research questions are answered using tenets from new institutional theory (NIT) and sociomateriality. The evidence is drawn from semi-structured interviews, observations and textual data. Semi-structured interviews were conducted with individuals in the UK and mainland Europe who are actively involved with BDA in the audit field and elsewhere. The individuals hold BDA related positions in audit firms, regulatory agencies and consultancy firms. Observations were carried out at audit firms on how proprietary BDA tools are operated and used in audits and other assurance areas. Textual data from websites and documents published by audit firms, regulators, standard setters and professional bodies on BDA and related areas were also collected. Therefore, the study adopts an interpretive paradigm in which qualitative research methods are employed.
1.3 The contribution of the study

The significance of this study is threefold. First, it provides an empirical account of BDA in practice in the audits of financial statements. This is important because, until now, most studies of BDA have been largely conceptual and normative in their framing. This is one of the first studies to provide empirical evidence from the audit field about how BDA is being promoted and used. So far, professional bodies (e.g. ICAEW) and regulatory agencies (e.g. FRC and IAASB) have provided thematic and technical reports on BDA in audits. This study provides an academic dimension to the empirical accounts while drawing evidence from multiple sources (audit firms, regulatory agencies and consultants), adding depth to the findings. In doing so, the study contributes to the academic literature in auditing on BDA which is very limited, especially in terms of studies that have adopted an interpretive approach.

Second, debates and discussions are continuing at regulatory (FRC, 2017) and standard setting (IAASB, 2016) levels on the efficacy of BDA for external audit proposes. This study adds another dimension to those discussions by providing evidence from the field on issues relating to BDA which could have significance for standard setting, as well as for developing training programmes for auditors in a data driven environment (Curtis et al., 2016). The tensions that have been highlighted in this study could provide regulatory agencies with an understanding of the challenges being experienced in practice. Further, the capabilities of BDA could also motivate audit firms and regulators to find opportunities to promote BDA to enhance audit quality.

Third, the study is significant because it complements the two theoretical lenses of NIT and sociomateriality and provides an understanding of the interplay between auditors and BDA during technological change, in particular of how social (auditor) and material (BDA) are implicated in the reconfiguration of an institutional space (audit field). While audit firms portray BDA as technical progress, this study extends this conceptualisation to explore the other roles of BDA, which are symbolic for the audit profession. In that way, the social relevance of auditing is understood in the context of legitimacy, identity construction and the affordance of BDA. Thus, for the audit profession to remain socially relevant, the properties
of the audit technologies (material objects) it uses are just as important in explaining the change that is happening in the audit process, in particular how such properties are either influencing or limiting the auditor in conducting an audit. Further, both material objects and discursive strategies facilitate how auditors acquire moral and pragmatic legitimacy as well as the identity that resonates with this technology use and the context in which auditors operate. This study adds to the auditing literature on audit technologies by stating that the methodological change in auditing should be conceptualised as a change in both audit technology and auditor identity. The promotion of BDA can be regarded as the promotion of a revised auditor identity which also attempts to remain socially relevant. In addition, audit technologies are involved in the shaping of the audit profession much as they are shaped by it. The study also provides us with insights on how audit firms use technologies prevalent at the time to (re)define their roles and the markets for audits.

1.4 The structure of the thesis

The thesis is organised as follows: Chapter 2 provides a literature review of BDA and earlier audit technologies, thereby situating BDA within the broader context of developments in audit methodologies and technologies. The aim is to establish the current state of the BDA literature in auditing and also to highlight motivations for developing audit technologies and the various roles (technical and symbolic) they serve. Relevant gaps in the literature are identified and are then linked to this study.

Chapter 3 discusses the theoretical framework used in this study. It introduces NIT as the overarching theoretical context and draws on sociomateriality to enhance the understanding of audit technology in the institutional context. Three theoretical constructs are identified, namely rhetorical strategies, identity regulation and affordance, with discussion of how these are used to address the study’s three research questions.

Chapter 4 explains the research philosophy and methodology for the study. It situates the study within the philosophical underpinning of an interpretive paradigm, which leads to a qualitative research approach, and provides a rationale for, and discussion on, the methods
used to collect the data. It also provides an overview of how the evidence is analysed to address the three research questions.

The empirical findings are covered in Chapters 5, 6 and 7, with each one dedicated to a particular research question. Chapter 5 addresses research question 1 by providing evidence of how audit firms are promoting BDA to relevant stakeholders (clients and regulators). The challenges of the process are also discussed. Chapter 6 explains the targets and means for encouraging auditors’ use of BDA on the part of audit firms through the construct of identity regulation. Finally, Chapter 7 extends the discussion in Chapter 6 to investigate the properties of BDA, and how these are influencing the audit process and relations within firms as multidisciplinary services.

Chapter 8 summaries the study’s findings by discussing its implications, contributions and limitations as well as areas which might be considered for future research.
CHAPTER 2. LITERATURE REVIEW

The purpose of this chapter is to provide a background for the study by placing developments in BDA within the context of previous developments in audit technology. To do so, the chapter attends to auditing literature that focuses specifically on such developments. The aim is to understand the rationale and motivations for these developments, and their embedding in, and impact on, the audit process. This also requires a review of literature which places auditing in an environment involving political, social and economic factors, so that we can evaluate the implications which audit technologies have on either facilitating or constraining relationships and practices within the audit environment. That environment (or field) is defined here as a space where “audit firms, clients, investors, professional associations, regulators and... educational institutions” (Robson et al., 2007, p. 410) interact as they pursue particular or various goals.

The literature shows that the development of audit technologies is linked to the desire for audit firms to develop audits as products that appear unique and credible in the eyes of regulators and clients. The argument is that credible audits would enable auditors to meet professional demands, whereas unique audits would appeal to the commercial goals of the audit firms (Curtis and Turley, 2007). Further, technological change shapes the way auditors see themselves at a given point in time. Therefore, changes in audit technology are implicated in the quest for auditors to remain socially relevant in times when such relevance is at stake. This is possible because auditors appear either to attach technical and symbolic roles of the audit technology, or to revise these roles, in meeting both professional and commercial demands.

The chapter is structured as follows: Section 2.1 provides a discussion of prior developments in audit technologies. The aim is to link BDA to the history of developments in audit methodologies and provide an account of the conditions of possibility as well as of the challenges associated with embedding audit technologies. Section 2.2 provides an overview of BD in general and goes on to discuss the genesis of BD and BDA in auditing. Section 2.3 reviews some of the current studies of BDA in auditing with the purpose of establishing how
BDA has been researched so far. Section 2.4 summarises the chapter by identifying the gaps in the current studies of BDA in relation to the extant literature on audit technologies.

2.1 Prior developments in audit technologies

The extant auditing literature contains considerable evidence of how audit firms have responded to public questioning of the quality of audit work and the social relevance of the audit function with methodological and technological developments designed to restore confidence in the effectiveness of the audit process (Carpenter and Dirsmith, 1993; Power, 2003; Curtis and Turley, 2007; Robson et al., 2007;). These studies show that the motivation for firms to either develop or change technologies is influenced by two factors. First, audit firms desire to meet regulatory requirements and are concerned about playing a crucial role in how various technologies are introduced and used (see Figure 2.1). In this regard, firms have several rationales for changing audit technologies. Second, audit firms have to address their commercial interests. In this way, audit technologies serve to expand assurance services that firms engage in, in order to generate more revenue and profits (see Figure 2.2).

2.1.1 Rationales for technological change: addressing regulatory concerns

The literature identifies various rationales which could be ascribed to technological change in meeting regulatory imperatives. Historically, developments in audit technology have been promoted by auditors as technical improvements to the standard of audit work (Power, 2003). As a result of such developments, the process of conducting an audit has been subject to continuous objectification, formalisation and streamlining (Newton and Ashton, 1989; Fisher, 1996). A significant feature of the literature on developments in audit practice has been the apparent tension between ‘structure’ and ‘judgement’ (Cushing and Loebbecke, 1986; Turley and Cooper, 1991), whereby the risks and economics of the firm create an imperative for more structured and more programmed methodologies to promote efficiency and cost saving (Newton and Ashton, 1989), which can then appear to conflict with the desire to represent auditing as an activity involving a high degree of individual, professional and expert judgement.
The formalisation of the audit process meant that decision aids had to be employed in the conduct of an audit, including electronic working papers and computer assisted audit techniques (Turley and Cooper, 1991; Power, 2003). Such formalised instruments were offered as technical improvements to raise the standard of auditing but were also underpinned by more implicit rationales of efficiency and cost minimisation to manage the time spent on ‘unnecessary’ procedures (Newton and Ashton, 1989).

**Figure 2.1 Rationale for technological change in addressing regulatory concerns**

Dirsmith et al. (2015) note that audit firms realised that they were operating in a litigious environment and that any audit failure could potentially hit their pockets and affect their reputations. To address this challenge, audit firms started providing structured audit approaches in which audit technologies are developed to assist in decision making. Expertise and professional judgements are perceived to be facilitated by or encoded in the technology (Fischer and Dirsmith, 1995), thereby enabling auditors to arrive at similar conclusions on key audit judgements (Power, 1995). While this might create tensions between administrators
and practitioners (Curtis and Turley, 2007), audit technology is perceived as a means of offering a more structured approach. Such an approach has been seen as representing an increasingly routinised audit process, “subject to formalized prescriptions and restraints” (Bamber and Snowball, 1988, p. 492). The audit itself has thus been viewed as a technical practice and any related changes in methodology as serving the purpose of codifying and streamlining the auditor’s judgements (Newton and Ashton, 1989; Dirsmith and Haskins, 1991; Turley and Cooper, 1991). It is argued, for example, that the introduction of statistical audit sampling, the ARM and BRA served to imagine a structured audit approach as a scientific process with emphasis on the seemingly objective, almost ‘factual’ nature of evidence gathering (Power, 2003).

Besides portraying audit technologies as technical developments and a means for producing structured audits, previous research has argued that the introduction of audit technologies (statistical sampling, the ARM and BRA) into audit methodology has followed a pattern of representing auditing as the collection of objective, almost ‘factual’, evidence. Matthews (2006b) demonstrates, for instance, how the introduction of statistical sampling in the early 1960s was portrayed as addressing the claimed deficiency of conventional methods of evidence gathering to meet the conditions of a changing business environment characterised by significant growth in the volume of transactions. Increasing complexity and volume of available audit evidence motivated auditors to seek more cost-effective approaches to audit planning, while at the same time managing clients’ expectations and demands as to the standard of audit work. The rise of statistical sampling provided an opportunity for auditors to legitimise a reduction in the volume of audit evidence by using mathematical techniques that invoked trust in the sampling process. In particular, the use of confidence levels in the application of statistical sampling provided the metrics through which auditors’ professional judgements were easily converted into conclusions that they could justify more easily to their clients (Elliot and Jacobson, 1987; Carpenter and Dirsmith, 1993; Mathews, 2006a). Therefore, the use of statistics in the audit evidence collection and evaluation process was aimed at increasing confidence in choices regarding sample sizes (Higson, 2003), as well as shielding auditors from potential challenges to their judgements (Sully, 1974).
Similarly, further technological developments in the form of the ARM and, later, BRA have been interpreted in terms of reinforcing the legitimacy of the audit process (Hansen and Messier, 1986; Power, 1997; Curtis and Turley, 2007; Robson et al., 2007). Curtis and Turley (2007), for example, argue that, in the late 1990s, the world’s largest audit firms made significant efforts to influence public perceptions of the BRA model as a major innovation in audit methodology with “a potential to enhance audit effectiveness... [and] the best way in which an auditor will be able to recognize management fraud and business failure risks” while, at the same time, dismissing concerns that the technology could be used to “redefine auditing as consulting and to facilitate identification of opportunities for providing value added services to clients, with the intention of improving the status and profitability of the auditor” (pp. 439-440). The rise of BDA in auditing should therefore be understood in the longer term historical context of the above developments in audit technology and auditors’ attempts to promote technological solutions for the problem of maintaining (or restoring) the legitimacy of the audit function.

The issue of legitimacy also extends to when there is a crisis, such as the financial crisis of 2007-08, or the collapse of a big corporation, which subjects audit firms to criticisms that could render the profession’s social relevance questionable. At this point, the trust between auditors and society is deemed to be broken (Sikka, 2009). Auditors have a vested interest in making a case that they can be trusted again (Holm and Zaman, 2012). Prior research shows that audit technologies are used to instantiate the abstract knowledge of auditors which is challenged during the crisis (Matthews, 2006b; Robson et al., 2007). The role of new audit technology in this case is not only to restore trust in the form of changing the way audit procedures are conducted (Power, 1997), but also to provide images of an audit as a revamped and sanitised product compared to the “dirtiness” of the past (Douglas, 2000).

Audit technologies also operationalise the application of auditing standards (Humphrey and Moizer, 1990), thereby demonstrating adherence to achieving audit quality as demanded by the regulators (FRC, 2014). Technologies like ARM portray an image that auditors are able to audit complex areas of business, classified as inherent risks (Power, 1995), which were deemed to be the source for most corporate scandals. This suggests that technologies offer utility to the auditor’s professional judgement.
2.1.2 Rationales for technological change: meeting audit firms’ commercial goals

The motivation for commercial goals relates to audit firms’ desire to enhance profitability and competitive advantage (Power, 1997; Malsch and Gendron, 2013; Andon et al., 2015). The developments in audit technologies, such as statistical sampling (Matthews, 2006a) and BRA (Curtis and Turley, 2007), have been linked to addressing the economic challenges that audit firms were experiencing (see Figure 2.2).

Figure 2.2 Rationale for technological change in meeting audit firms’ commercial goals

Complexity in organisational transactions, globalisation and advancement, and stagnation in audit fees have all been cited as reasons for reviewing or changing audit technologies and methodologies (Robson et al., 2007). For example, it is not efficient from an economic viewpoint to investigate each transaction in a population. Therefore, it is argued that statistical sampling was designed as a means of reducing the amount of substantive testing
to enhance audit efficiency (Higson, 2003; Matthews, 2006b). It provided the means to rationalise the audit sample chosen as objective, thereby appealing to the rational technical function and the economics of auditing (Humphrey and Moizer, 1990).

Given that the markets for auditing continue to stagnate and profits to decline, the audit profession is always concerned about the impact this might have on the profession’s status and jurisdiction boundaries (Dirsmith et al., 2015). The profession, through several projects (e.g. Global Credential Initiative) and reports (the Elliot report), has problematised the market for audits (Shafer and Gendron, 2005; Robson et al., 2007; Guo, 2016), whereby proposals for an entrepreneurial auditor role have been made (Dirsmith et al., 2015). This marked a significant shift in the institutional goals of the audit profession (Suddaby and Greenwood, 2005; Andon et al., 2015). The audit process became a space where audit firms addressed regulatory concerns and commercial goals (Humphrey and Moizer, 1990; Cooper and Robson, 2006). It is argued that, in order to address regulatory concerns and commercial goals of audit firms, risk-based approaches and technologies (Robson et al., 2007) were used. This offered auditors an opportunity to use the audit as a means of understanding the potential business problems which were classified as “business risks” (Power, 2013), and which could then be addressed by the provision of services other than the audit. Since politicians and practitioners were worried about the erosion of auditors’ independence through the provision of audit and non-audit services (Curtis and Turley, 2007; Sikka, 2009), risk-based technologies such as BRA rationalised the blurred boundaries between the two (Jepperson, 1988; Dirsmith et al., 2015). BRA was presented to clients as an audit technology that adds value to the business, rather than just meeting the statutory obligation of testing compliance (Robson et al., 2007). Therefore, developments in ARM, as well as in statistical sampling, are seen as continued attempts by audit firms to rationalise the scope of audit work that are linked to potential areas of business risk requiring additional work in the form of consultancy (Humphrey and Moizer, 1990; Power, 1995).

It has been argued that developments in technology such as BRA were part of the professionalisation project to reconfigure the market for audits, which was in decline (Curtis and Turley, 2007; Robson et al., 2007). Further, it is contended that re-conceptualisation of BRA to focus on value adding activities was part of facilitating consultancy-type work which
could emerge from the audit. Therefore, in BRA, audits of clients were meant to act as feeders for more lucrative consultancy work (Knechel, 2007). Similarly, audit firms such as KPMG and Deloitte have expanded their activities to act as trust custodians for other non-audit services, such as the MBA ranking published in the Financial Times newspaper (Free et al., 2009) and the process of awarding BAFTAs to various people in the entertainment industry (Jeacle, 2014). Many of these services do not follow prescribed audit methodologies as used in statutory financial audits, but employ audit technologies such as analytical procedures, working papers and even statistical sampling (Free et al., 2009) in their evaluation and verification processes. These technologies in this case act as legitimisation tools for the process of engendering trust in spaces other than financial statement audits. Curtis and Turley (2007) also note that BRA has provided a means of screening clients so that only those that are regarded as less risky may be retained.

Auditors have relied on audit concepts such as materiality in conducting services in areas like the environment (environmental audits, sustainability assurance) and intellectual property (brand valuation) (Power, 1997; O’Dwyer et al., 2011; Canning et al., 2018) in order to make such spaces auditable. Making a domain auditable could be regarded as the means through which areas that appear to be peripheral to the audit process could now be amenable to it (Andon et al., 2015). Others have attributed this condition to the calculative practices embedded in these [audit] technologies (Jeacle and Carter, 2011). Therefore, the adoption of statistical sampling and the ARM in audit methodology could be described as a portrayal of auditing as an objective process. Terms such as “materiality”, “error”, “risk”, “quantification”, “statistical” and “evidence” are all associated with numeracy and scientific measuring. These measures could enable ideas from auditing to travel to other domains outside of the audit and could therefore make such domains auditable.

Overall, the technologies employed in the audit process have both technical and symbolic roles. As observed, they make it possible for the expertise of auditors to be instantiated and for trust to be engendered or restored. In doing so, auditors are able to create social and economic capital through jurisdiction expansion (Andon et al., 2015). This expansion is also changing the identity of auditors. Guo (2016) argues that the need to address regulatory concerns and commercial goals is transforming auditors into versatile experts with the ability
to offer help to clients as well as to attest their financial statements. Robson et al. (2007) provide a similar perspective by suggesting that BRA was meant for auditors to see themselves as, and transform themselves into, business consultants constantly searching for other assurance services whilst conducting an audit. Malsch et al. (2011) note that auditors have to demonstrate entrepreneurial tendencies in order to progress in their careers. These tendencies include the ability to establish contacts through networks in order to conduct business. In this regard, Suddaby et al. (2015) show how social media is used to portray auditors as having the image of business consultants with a celebrity status. They observe that social platforms such as LinkedIn are now populated with profiles of auditors with an emphasis on industry expertise rather than on their technical skills. However, this process of embedding technology in order to appeal to both professional and commercial goals is not conducted in an unproblematic manner, as alluded to by Curtis and Turley (2007) and Fischer and Dirsmith (1995).

2.1.3. Embedding audit technologies and challenges

The existing literature also demonstrates the tensions that exist when audit technologies are introduced at the organisational and field levels. At the organisational level, the tensions are between administrators and practitioners (Fischer and Dirsmith, 1995; Curtis and Turley, 2007), experienced and less experienced practitioners (Fischer and Dirsmith, 1995), local and global offices (Barrett et al., 2005), and auditors and internal specialists such as IT auditors (Hux, 2017). At the field level the tensions include those between audit firms and audit institutes (Barrett and Gendron, 2006), firms and regulators (Humphrey et al., 1993), and the audit profession and other professions (Suddaby and Greenwood, 2005).

The tensions could be explained by the power and identity struggles that exist within the field (Guo, 2016; Hux, 2017). Fischer and Dirsmith (1995) provided a distinction between the roles and interests of administrators and practitioners which could explain the source of the tensions. They stated that the role of administrators is to make sure that the audit firm’s legitimacy in society is maintained. Therefore, administrators engage in activities that appeal to the political and economic rationalities of the context in which the firm is operating. At this level, the objective is to demonstrate compliance with the political ambitions of the state. In
the event of a crisis, the administrators, as the face of the firm in the political arena, would attempt to demonstrate that audit firms are putting in place mechanisms to rectify the situation. Equally, they are also involved in developing strategies to make sure that, as businesses, audit firms are competitive. These strategies include developing audit approaches that are deemed to address the ideas of auditing and broader political rationalities. They also create means through which practitioners are able to exploit business opportunities during the audit. Developments in audit technologies are seen as attempts by administrators to create an audit that is credible and unique in the eyes of the regulators and clients (Curtis and Turley, 2007), and also as a means of controlling and managing practitioners (Carpenter and Dirsmith, 1993) so that litigation can be defended and the economics of auditing can be managed (Power, 2003).

On the other hand, Fischer and Dirsmith (1995) stated that the role of practitioners is to translate the ideas of auditing into practice. They are required to follow the prescribed procedures encoded in the audit technologies in order to achieve the administrators’ desired results. They also interact with clients during the audit engagement, which means they act as the interface or access point between the audit firm and client (Giddens, 1990). The use of technology in the audit process is meant to demonstrate their expertise as rational, efficient and effective, thereby fulfilling the delivery of quality audits. Practitioners also identify opportunities for more business for the audit firm. Their encounters with the clients are seen as vital in retaining clients for future audit engagements as well as in enhancing the firm’s profitability. They are the human carriers of commercial and professional goals. Potentially, this arrangement means that the introduction of technology is problematic and the literature has identified sources of these tensions, namely conflict between judgement and structure as well as the efficiency and effectiveness dilemma.

Regarding the judgement and structure debate, Fischer and Dirsmith (1995) found that practitioners perceive the introduction of audit technology as diluting their autonomy, requiring the exercise of professional judgement on certain areas of the audit. Professionals such as auditors are deemed to have a low technical / indeterminacy ratio, suggesting that being flexible in making judgements, as opposed to using routinised procedures, is what allows them to make claims to have expert knowledge (Power, 1995, 1997). Therefore, the
introduction of technology is seen as an intrusion into their realm of decision making. The view is also linked to concerns about deskillling, thereby lowering the status of auditors (Robson et al., 2007). On the other hand, administrators are concerned about issues pertaining to audit quality, so they develop ways and means which could give them the ability to monitor what auditors are doing (Carpenter and Dirsmith, 1993). Consensus in how decisions are made among auditors is perceived to indicate quality audits. In this regard, encoding judgements which auditors are required to make at a particular stage of the audit within a technology would assist in monitoring and coordinating the work of auditors (Barrett et al., 2005).

The efficiency and effectiveness dilemmas are associated with the market for audits, which is competitive and has witnessed a stagnation in fees (Robson et al., 2007). Administrators attempt to introduce audit technology in order to address the issue of cost associated with the provision of audits. New technologies eliminate some of the audit procedures regarded as inefficient, thereby streamlining the audit process. For instance, Barrett et al. (2005) noted that BRA was introduced to reduce the amount of documentation associated with the process. Equally, Carpenter and Dirsmith (1993) indicated that statistical sampling was a means of rationalising the reduction in substantive testing. The economics of auditing is argued to prompt administrators to introduce more structured approaches (Knechel, 2007).

However, Curtis and Turley (2007) indicated that this approach was unsuccessful because the administrators did not consider the impact this might have on auditors’ confidence in delivering audits that would meet the audit objectives. They also observed that auditors struggled to find a link between procedures in BRA and the audit opinion. Fear of audit failure and potential litigation meant that auditors were doing more work than previously planned. Similar observations were also revealed in Barrett et al.’s (2005) study on the implementation of BRA in a local office of a global firm. Here, the local auditors did not fully trust the system associated with BRA because it reconfigured procedures in such a manner that it was difficult to demonstrate the audit trail. The automation of working papers and other procedures meant that other documentation, such as bank reconciliations, would be difficult to store or could easily be misplaced. Therefore, in the event of a court case, this might work against the auditor as evidence of poor audit work. Curtis and Turley (2007) indicated that the ambiguous
nature of BRA as a programme of change meant that auditors did not understand their role in this approach. In particular, auditors appeared not to be equipped with the skills to market BRA to clients as a platform for generating more revenue. This could point to an ambivalence in auditors’ understanding of their identity as professionals or business consultants, thereby highlighting the challenges auditors face when new audit technology is introduced making their role less clear. Hux (2017) notes that the use of specialists, such as IT and forensic auditors, to provide expertise which financial statement auditors lack, does not yield the intended benefits because auditors are reluctant to use such specialists. This observation could be significant in BDA, in which the use of data analysts appears to be more pronounced.

In sum, previous studies on audit technologies provide significant evidence showing the dynamics of technological change, in particular the rationales for audit firms to develop and change these technologies. The main key message from previous research is that technological changes in auditing stem from the desire of audit firms to remain compliant with regulations and to be competitive in the audit environment. Further, audit technologies act as technical and symbolic means of fulfilling audit firms’ regulatory goals, as well as other goals such as profitability. The findings from the current literature are relevant to studying BDA as the latest technological innovation. The amounts that audit firms are investing could signal that their motivations in the BDA environment go beyond addressing regulatory concerns. Also, establishing how new technology is promoted, based on previous studies, could offer significant insights into the rationales for introducing BDA. Therefore, in the next section a discussion on BDA in auditing is provided to understand the current state of studies on BDA. The aim is to establish how these studies complement those on audit technologies.

2.2 Big Data and Big Data Analytics in auditing

As mentioned previously, developments in BDA which have been attracting a lot of attention could be linked with earlier developments in audit innovation. From 2012, researchers and regulators in North America have been discussing BD and suggesting that the audit environment is either being populated with BD or becoming data driven. For instance, in 2012 the American Chartered Institute of Public Accountants (AICPA), while not specifically mentioning BD, established initiatives which highlighted the importance and relevance of
data in the provision of audit and assurance services. Such initiatives were meant to result in the possibility of developing audit data standards. In order to operationalise this endeavour, a task force (Assurance Service Executive Committee Technologies Task Force) was set up to offer guidance on developing the conceptual frameworks for data being used in audits (Zhang et al., 2012). In the same year, AICPA published a white paper, entitled “Evolution of auditing: From the traditional approach to the future audit”, which problematised the current state of auditing and indicated a preference for a data driven audit approach. AICPA initiatives attracted the attention of other standard setters and in 2013 the IAASB also acknowledged the importance of technology and the potential impact of BD on audits of financial statements. Like AICPA, it created a task force, called the Innovation Working Group (which later became the Data Analytics Working Group) to explore emerging technologies, such as BDA, and how they could be used to exploit opportunities relating to the provision of assurance services, including auditing (IAASB, 2013).

By 2013, professional bodies and some audit firms were referring to BD in their publications and presentations. For example, professional bodies in the UK started discussing BD in the context of the value it could generate in financial reporting and business in general (Accountancy Futures Academy, 2013; ICAEW, 2014). They were noting how the ubiquitous use of BD could potentially transform the audit environment (Cao et al., 2015), since there were opportunities for other forms of data to be regarded as audit evidence because of their size and nature. Furthermore, such data is collected at high speeds from multiple sources within and outside of the client businesses (Gandomi and Haider, 2015). Apparently audit firms, while agreeing that clients’ environments have BD (KPMG, 2014a), initially appeared reluctant to characterise such environments in this manner. However, like many organisations in other fields, such as marketing, telecommunications and retail, audit firms started developing and advancing analytical tools to exploit opportunities derived from BD. These tools, as mentioned before, are called Big Data Analytics (BDA) and are the focus of this study. Therefore, in the following discussion BDA and, in particular, the development of BDA in auditing is presented as an institutional and social event (Hopwood et al., 1983; Robson et al., 2007). The discussion is not intended to provide a detailed account of BDA’s technical capability but rather provides a working definition of BDA for this study and explores the
nascent accounts of BDA that have been discussed and circulated among relevant stakeholders in the field. It concludes with an overview of current studies of BDA.

Various definitions have been given in relation to BDA. In auditing, BDA is commonly defined as “the science and art of discovering and analyzing patterns, identifying anomalies, and extracting other useful information in data underlying or related to the subject matter of an audit through analysis, modeling, and visualization for the purpose of planning or performing the audit” (AICPA, 2014, p. 5). This study adopts this definition, which attempts to link auditing, as a body of knowledge, with an emerging field of data science as the audit profession pursues the delivery of quality audits. Data science, as a body of knowledge, draws its theories and assumptions from diverse disciplines, such as mathematics, statistics, computer science and machine learning (AICPA, 2014, p. 10). The present study recognises that images of scientific rationality, such as concepts and techniques drawn from data science, could be essential in the production of legitimacy for the audit process among its constituents (Humphreys and Moizer, 1990; Power, 2003).

While it is acknowledged that the use of BDA in auditing is in its infancy (Alles, 2015; IAASB, 2016a; FRC, 2017), the use of analytics in the audit process is not necessarily a recent phenomenon. Audit firms have been using computer based and non-computer based analytical tools since the 1960s, when some firms developed analytical review techniques and computer assisted audit techniques (CAATs). For instance, Haskins and Sells (now Deloitte) introduced a CAAT called AUDITAPE (AICPA, 2012), which was used to interrogate data and which also embedded statistical sampling in its operations to assist auditors to determine the sample size (Matthews, 2006b). The objective of investing in computer packages, then, was not significantly different from what is being said about BDA. It is argued that the desires to remain competitive and to have a structured audit methodology has enhanced the appetites of audit firms for investing in analytical tools such as CAATs (Cushing and Leobbecke, 1986). Structured methodology has been defined as “a systematic approach to auditing characterized by a prescribed, logical sequence of procedures, decisions and documentation steps, and by a comprehensive and integrated set of audit policies and tools designed to assist the auditor in conducting the audit” (p. 32).
However, the uptake of CAATs among practitioners was not encouraging because of a lack of compatibility and competence. Compatibility was an issue because clients’ and firms’ hardware or software could not synchronise with one another. Further, practitioners at most firms did not have the computer literacy to operate the computer packages (Turley and Cooper, 1991). From 1980, computer vendors developed off-the-shelf analytical tools, such as ACL and IDEA, which most audit firms started using as part of their analytical suites. These tools provided the genesis of what is regarded as BDA in auditing today because of their ability to be operated with minimal specialist competence and to analyse larger datasets.

The drive for structured audit methodologies influenced the introduction of automated decision support systems aimed at helping auditors on the ground to reach uniform conclusions when exercising professional judgements. Studies have illustrated the tensions between auditor autonomy in making professional judgements and the desire of audit firms to develop structured methodology that could either demonstrate audit quality or be used as a means of defence in litigation (Fischer, 1996; Power, 2003; Curtis and Turley, 2007; Dowling and Leech, 2014).

While ACL and IDEA could be regarded as early pioneers of analytical tools, developments in the manner in which audit clients were managing their information through technology also paved the way for the current architecture of BDA. In the 1990s, computer companies started developing information platforms such as SAP, which provided larger data warehouses for keeping information and managing information flows between different business units of an organisation in a centralised manner (O’Leary and Markus, 2006). Such platforms are collectively classified as enterprise resource planning (ERP) systems and had an effect in transforming the way information for audit purposes was stored. Curtis and Payne (2008) observed that, despite having analytical tools such as CAATs to work on these systems, auditors were underutilising them. Some researchers (Vasarhelyi and Halper, 1991 Higson, 2003) were indicating that such advances in technology could soon make the audit of financial statements real time and referred to this as “continuous audit”. It is not surprising that in the late 1990s, as the capacity of data warehouses and ERPs expanded, it was inevitable that the information clients were collecting was increasing in volume and was becoming multi-dimensional so that it included structured and unstructured data. At this point, understanding
the client’s business to assess the potential risks for audit purposes became the focus of the audit methodology dubbed BRA (Curtis and Turley, 2007; Knechel, 2007). BRA also entails the pervasive use of technology in the audit process (Lemon et al., 2000). Therefore, the proliferation of technological devices that could capture and process data gave rise to the acknowledgement that the business environment is characterised by the digital phenomenon called BD.

**BDA developments in the audit environment**

It could be argued that audit firms started using analytical tools in the context of BD in 2013. The FRC audit quality thematic review (2014, p. 12) on the auditing of loan loss provisions and related IT controls in banks and building societies found that, between July and December 2013, “three firms (of the Big Audit firms).... use[d] data analytics.... the first time”. Audit firms were attaching BDA to the provision of quality audits of financial statements (Ramlakun, 2015). Later, claims for the use of BDA in audits of financial statements became a common theme among audit firms. They were now explicit about claims for the relevance of BDA within their audit work. Some audit firms announced they had developed proprietary analytical tools to replace, or be used in conjunction with, the ACL and IDEA tools. As noted before, PwC developed Halo (PwC, 2014b); EY came up with Helix, while KPMG introduced their own analytical tool called Clara (EY, 2016; KPMG, 2017). Other firms are using off-the-shelf analytical tools, such as Spotlight, Lavastorm and Alteryx (ICAEW, 2016), to enhance their BDA capabilities. It should be noted that most of the developments in BDA tools are made at the global level of audit firms and are then appropriated at the country level for implementation. In this regard, BDA tools developed at a global office, for example in North America, are circulated to other offices across the globe (Barrett et al., 2005).

While audit firms are actively developing and experimenting with new BDA tools, the professional bodies, standard setters and regulators are pursuing initiatives to consider the use of BDA and discuss its impact on auditing standards (AICPA, 2014; IAASB, 2014; FRC, 2017). In 2013, AICPA set up a task force to work on how BDA could be used in audits of financial statements with a possibility of developing a data standard. The standard is meant to prescribe the criteria for data files and fields which auditors have to follow when collecting
audit evidence (AICPA, 2013). AICPA is also working with academics at Rutgers University and has published a series of documents, for example a white paper called *Reimagining Auditing in a Wired World*, in which a conceptualised audit environment was depicted using vignettes. Drawing on data science and auditing, the paper suggested areas of audits which could benefit from BDA (AICPA, 2014). Since then several audit data standards publications have appeared addressing the information contained in some of the general ledgers and sub-ledgers on clients’ ERPs (AICPA, 2015, 2017). At the international level, IAASB has also considered the importance of technological advancement in audits of financial statements and other assurance services. In its proposed strategy for 2015-19 (IAASB, 2014), BDA was regarded as one of the significant technologies which should be explored because of the ubiquity of BD in the business environment and it was also implied that the process of audit inspections was revealing its use (FRC, 2014; IAASB, 2014).

The aforementioned DAWG was then set up in 2015 to advance IAASB’s understanding of BDA in terms of the opportunities and challenges it creates in the provision of audit and assurance services. The working group, which is mainly comprised of partners from the large audit firms (unlike the AICPA task group, which has both firm partners and academics), has so far embarked on outreach activities, soliciting views from various stakeholders in the field and publishing milestones for its projects. The outcomes of these activities demonstrate that there are differences in the audit environment on whether or not standards have to be revisited to consider BDA. This has prompted the DAWG, in 2017, to establish the Data Analytics Project advisory panel to act, among other things, as a technical resource. The panel draws expertise from regulators, researchers, audit firms and companies that develop BDA tools.

Professional bodies, such as ICAEW and ACCA, have also been sensitising their members to the role of BDA in audits of financial statements. ICAEW first published *Big data and analytics – what’s new?* to inform its members about the impact of BD and BDA on their organisations (ICAEW, 2014). The document was meant to highlight the value that BD and BDA could create for various organisations in general. This was followed by a research document based on 12 interviews, called *Data analytics for external auditors – International auditing perspectives: An International Accounting, Auditing and Ethics Initiative*, which situated BDA within the
context of the broader discussion on audit quality and other regulatory developments in auditing, such as compulsory competitive tendering and audit rotation (ICAEW, 2016). Recently, a document that covers auditors’ experience of BDA, entitled *Evidence, not assumption – Audit insights: data analytics*, was published to provide “an opportunity for external auditors to share some of their knowledge of specific sectors with the public, capturing more value for a wider audience” (ICAEW, 2017, p. 2). The contents of these documents could indicate the challenges the audit profession is experiencing in persuading clients onto the BDA platforms (IAASB, 2016; FRC, 2017).

Regulators such as the PCAOB and the FRC have also acknowledged the use of data analytics in audits of financial statements. For example, the FRC first acknowledged firms’ use of BDA in 2013 in their audit quality thematic review report on how auditors for banks were auditing loan loss provisions. Here, the FRC identified the use of data analytics as one of the ways to counter some of the problems or challenges associated with the provision of audits (FRC, 2014, p. 6). The audit quality inspection reports of some large firms have also started mentioning claims that BDA was being used to address some of the recurring concerns about audit quality such as revenue recognition and fraud risk factors (FRC, 2017). The pervasiveness of such claims has influenced the FRC to explore the uses of BDA in audits. In 2017, a thematic review report on BDA in audits was released, in which it was observed that BDA use is not as common as audit firms are reporting while acknowledging the intensity of the level of BDA development undertaken by audit firms (FRC, 2017).

Researchers in auditing have also taken the issue of BDA seriously. For example, in the UK, Imperial College London has teamed up with KPMG and set up the Centre for Advanced Business Analytics, which acts as a research platform to explore new ways of getting the best from BD and BDA (KPMG, 2014b). Alles and Gray (2016) acknowledge that, from 2015, the auditing research community saw an explosion of publications and presentations on BD, with the American Accounting Association (AAA) organising the first conference on Big Data in New York City. Participants from diverse backgrounds shared their experiences and perspectives on BD and BDA. In the same year, the AAA ran a special issue on BD in a leading journal called *Accounting Horizons*. 
2.3 Current studies of BD and BDA in auditing

Recent auditing literature has provided some initial insights into the potential relevance of both BD and BDA. The studies are mainly conceptual (see Table 2.1).

Table 2.1 Selected studies on BD and BDA in auditing

<table>
<thead>
<tr>
<th>AUTHOR(S)</th>
<th>FOCUS OF STUDY</th>
<th>AREA (BD or BDA)</th>
<th>RESEARCH APPROACH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alles and Gray (2016)</td>
<td>Factors that inhibit the use of BD in financial statement audits</td>
<td>BD</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Alles (2015)</td>
<td>Factors that would either influence or constrain the use of BD</td>
<td>BD</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Appelbaum (2016)</td>
<td>How auditors could improve the reliability of BD as audit evidence by focusing on the provenance of BD</td>
<td>BD</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Appelbaum et al. (2017)</td>
<td>Areas of potential research in BDA through a review of current studies on BDA</td>
<td>BDA and BD</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Appelbaum et al. (2018)</td>
<td>Development of a framework for BDA which identifies areas to study analytical procedures in the BD environment</td>
<td>BDA</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Brown-Liburd et al. (2015)</td>
<td>The effects of BD on auditors’ cognitive abilities and factors that could impair</td>
<td>BD and BDA</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Reference</td>
<td>Focus</td>
<td>Method</td>
<td>Scope</td>
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<td>----------------------------</td>
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<tr>
<td>Cao et al. (2015)</td>
<td>How BDA could be used to improve the efficiency and effectiveness of financial audits</td>
<td>BDA</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Earley (2015)</td>
<td>Opportunities for BDA in auditing</td>
<td>BDA</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Krahel and Titera (2015)</td>
<td>The case for including BD in accounting and auditing standards, problematising the existing standards as not suitable for the data driven environment</td>
<td>BD</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Yoon et al. (2015)</td>
<td>BD as complementary audit evidence, taking into account the cost-benefits associated with it</td>
<td>BD</td>
<td>Conceptual</td>
</tr>
<tr>
<td>Perols et al. (2017)</td>
<td>The predictive ability of BDA regarding fraud, by identifying variables drawn from earnings management studies</td>
<td>BDA</td>
<td>Analysis of samples of companies, some of which are subject to fraud, on the SEC register</td>
</tr>
<tr>
<td>Zhang et al. (2015)</td>
<td>Links between BDA and the operationalisation of the continuous audit approach</td>
<td>BDA</td>
<td>Conceptual</td>
</tr>
</tbody>
</table>
Studies that have focused on BD highlight the opportunities for its use as audit evidence, as well as suggesting concerns regarding integrity of such data (Yoon et al., 2015; Appelbaum, 2016). These studies have discussed the potential benefits of BDA in structuring the audit process and the implications of BDA for the nature of evidence collected, including its effects on auditors’ professional judgements (Brown-Liburd et al., 2015). It has been argued that BD offers effectiveness while BDA generate efficiency in audits (Alles and Gray, 2016).

Vasarhelyi et al. (2015) argue that the change in technology and use of ERPs, such as Oracle and SAP (Systems, Applications and Products), are making BD available and that this has provided an opportunity for a paradigm shift in terms of how financial transactions are measured and recorded. However, Alles and Gray (2016, p. 45) stress that, when establishing BD, it is important to “differentiate between more of the same kind of data that auditors are already using, or more data of a different kind than what auditors have traditionally relied on to give an audit opinion [because] BD pushes the domain of data far outwards from financial data to non-financial data (NFD)—from structured to unstructured data and from inside the organization to outside it—to an extent that may well be outside the comfort zone and technical capability of the current audit profession”. Brown-Liburd and Vasarhelyi (2015) suggest that BD is bringing a plethora of potential audit evidence which auditors could draw on. The social media platforms, among other new forms of audit evidence, could be useful in understanding public sentiment about the products or services clients offer (Yoon et al., 2015). Further, Cao et al. (2015) suggest that unstructured data such as videos, text images and cell phone recordings could be useful as audit evidence for confirming the existence of events.

While others see BD as creating new forms of audit evidence, Yoon et al., (2015) argue that BD is complementary evidence for audit purposes, requiring careful consideration about what counts as such evidence. Prior research (Power, 1995; Matthews, 2006a) has indicated the challenges faced by auditors in determining audit evidence. Yoon et al. (2015, p. 432) argue that BD contributes to the “sufficiency” requirement because of its volume and the variety of data provided on a real time basis (velocity) because sufficiency depends on the risk of misstatement and the appropriateness (i.e., reliability and relevance) of the evidence collected. On the other hand, the noise in Big Data may cause an overload of false positives,
leading to lower “reliability”. They suggest that, in order to obtain value, BD should be used in conjunction with other traditional audit evidence when the latter is deficient. In this regard, manually inspected documents are deemed traditional evidence. The challenges that auditors face in making this determination include questioning the reliability and relevance of BD, since the source or origin of the data could be difficult to discern in many cases (Appelbaum, 2016).

Teteer et al. (2010) observe that ERPs are facilitating the possibility of remote audits in which the use of BDA would play a crucial role. Most research publications appear to agree that the audit profession is still to be regarded as one in which the BD environment and BDA are still developing. Therefore, given that BD and the use of BDA are very much developed in domains other than financial accounting and auditing, Cao et al. (2015) suggest that lessons could be learnt from such domains for use in financial auditing. They note that assessment of going concern and default risks could rely on social media and news articles in order to assess people’s sentiments about organisations. Equally, audit firms could use the same information on which to base their decisions on whether to retain an engagement, thereby reducing litigation risk. Brown-Liburd et al. (2015) state that BDA is potentially relevant to a number of technical aspects of audit practice, such as areas of risk assessment and performance of substantive and analytical procedures (Brown-Liburd et al., 2015). Cao et al. (2015) suggest, for example, that BDA provides opportunities for auditors to navigate messy data at a faster rate and to create patterns and trends which can provide a more microscopic visualisation of risks associated with the audited entity, assisting in determining the level of materiality and of substantive testing and other procedures to be carried out. As an example, they argue that evaluation of fraud risk can be enhanced through analysis of unstructured data such as emails to assist in identifying motivation to commit fraud and possible rationalisations used (p. 433). From the above discussion, Alles and Gray (2016) identify two ways in which BDA in auditing can be conceptualised (see Figure 2.3).
First, audit firms have for so long been operating in Box A, whereby they use traditional tools such as Excel, ACL and IDEA on financial data and partly on non-financial data on a small scale in Box C. Alles and Gray (2016) also argue that these traditional tools have now extended to include visualisation tools in Box B. However, they contend that BDA in auditing should be in box D, with advanced analytical tools such as machine learning being used, not only to evaluate the current state of the client, but also to perform predictive analytics and to offer clients further opportunities through insights. Recently, Appelbaum et al. (2017, p. 2018) have provided a comprehensive review of studies on BDA to establish a research agenda for understanding the use of analytical procedures. They have even proposed a framework that could facilitate the relevance of research on BDA.

In relation to professional judgement, Brown-Liburd et al. (2015) argue that, despite BDA providing numerous opportunities which can be derived from BD, it could also affect auditors’ professional judgements because of issues, such as the ambiguity of information (since information is collected and presented in different dimensions), information overload (due to limitation in the cognitive abilities of auditors to develop multiple cues for optimal interpretation of the data), and inability to identify relevant information and recognise patterns of information which could undermine the benefits of utilising BDA. This observation is at odds with the audit profession’s desire to achieve audit quality through automation (IAASB, 2014) and also with their objective of providing structured methodology to their clients (Turley and Cooper, 1991) in order to address the economics associated with auditing.
Alles and Gray (2016) note that BDA, as a paradigm shift, could be difficult to implement within the audit. In this regard, Krahel and Titera (2015) have suggested that such shortcomings could be addressed through the incorporation of BDA into formal auditing standards, to eliminate uncertainties in some areas of judgement. While this point warrants attention in some quarters of the profession, Alles (2015, p. 444) states that the “existing audit standards do not seem to constrain auditors in their use of Big Data [with] financial reporting”. He argues that current standards are more open and have been designed to accommodate the use of BDA because they allow auditors to use discretion in how to collect and analyse audit evidence, but that auditors are reluctant to use such discretion. This could be explained through Brown-Liburd et al.’s (2015) observation that existing training for auditors is geared towards a traditional approach, not towards developing analytical skills relevant for data driven environments. Similar concerns have also been highlighted by Turley et al.’s (2016, p. 29) study of skills and competencies relevant for modern auditing, in which they note: “the development of data analytics as an important tool in the conduct of the audit... [T]his kind of analysis is increasingly of generic relevance but relies on expertise which has been located in specialist functions in the audit firms rather than something expected of all auditors.”

On the basis of all of the discussion on the topic and in the literature so far, this study sets out to investigate the following three questions:

1. What are the strategies audit firms employ to promote the relevance of BDA to relevant stakeholders?
2. What means do audit firms use to promote the use of BDA in the conduct of the audit?
3. How do particular properties of BDA impact on the conduct of the audit in a multi-disciplinary firm?

The first research question concerns how audit firms are promoting BDA to relevant stakeholders, in particular the ways they are attaching existing concepts and ideals of auditing to BDA. It is also designed to uncover how firms frame their accounts of the usefulness of BDA to relevant stakeholders and the way they manage possible tensions associated with the promotion of this technology.
The second question attends to the ways in which audit firms are encouraging their auditors to use BDA. It highlights the need to see the means through which technological innovations such as BDA are promoted and embedded in the practical conduct of an audit in a more holistic fashion, i.e. as measures that explicitly prescribe new practical approaches but also more implicit attempts to influence individual auditors’ aspirations, identities and their self-worth as professionals.

The third research question aims to show influences of the properties of the technology being adopted (BDA). Specifically, it investigates opportunities and constraints associated with properties of BDA in relation to auditors in performing audit procedures, thus showing how these properties both direct auditors and place limits on what they can do. In doing so, the study attempts to understand the impact of such properties on the means and dynamics of embedding BDA in audit practice. This area has been ignored in the previous literature.

2.4 Summary

This chapter has provided an account of the genesis of BDA in auditing by tracing it through the wider discussion of similar technological advancements. As with prior developments, the conceptualisation and understanding of BDA in auditing is drawn from another body of knowledge, namely data science, which has been placed at an intersection with auditing. Given that the audit profession gains its social relevance by adopting language and practices which carry images of scientific rationality (Abbott, 1988), BDA seems relevant because it belongs to data science as a body of knowledge. The key stakeholders in the audit field, namely firms, regulators, standard setters and researchers, are actively engaged in activities that could enable BDA to gain regulatory and normative legitimacy (Robson et al., 2007). The chapter has also placed developments in BDA alongside other audit technologies, such as statistical sampling, ARM and BRA, which have been developed as part of the audit profession’s desire to remain socially relevant. Thus, audit technologies are seen as a means of addressing regulatory concerns as well as commercial goals.
Besides researchers taking a normative stance on the implementation of BDA in the audit process, there is a lack of research on BDA providing empirical evidence on the way it is being promoted within the field and how it is used in practice. As observed, there are a few studies (Khalifa et al., 2007; Robson et al., 2007) that have looked into how audit technology is being promoted in the field. These studies have highlighted the role of discursive strategies and the appeal to normative and regulatory strategies to achieve legitimacy for the technology. This study extends this perspective, exploring how rhetoric is used to promote the use of BDA.

Second, although embedding of prior audit technologies within the audit process has been reported as problematic, it appears that researchers are portraying BDA as an already accepted technology. However, Alles and Gray (2016) argue for researchers to go beyond this assumption and explore further the conditions for the possibility of using BDA in audits of financial statements. Citing prior initiatives, namely WebTrust (Gendron and Barrett, 2004) and global credential projects (Shafer and Gendron, 2005), as points of reference for failed projects, Alles and Gray (2016) acknowledge that technological imperatives such as BDA cannot be as easily adopted as some studies suggest. They also observe that audit firms have, in the past, made claims about the use of artificial intelligence and continuous audits (Vasarhelyi and Halper, 1991) for the auditing of financial statements, but these are yet to materialise. The current literature on BDA does not give us any accounts of the means through which BDA is being encouraged to be used in the audit process, in particular how auditors are meant to embrace the change associated with BDA. However, changes in audit technology should be viewed as an attempt to influence change in audit practices as well as in the identity of auditors at a given point in time (Robson et al., 2007).

Finally, the chapter acknowledges that audit technologies are not passive in their role as facilitators of change in the field (Robson et al., 2007); they can also transform the field in which they are being introduced (Burri, 2008). The properties of BDA technology, especially (Leonardi, 2011), can facilitate transformation when auditors use them in the audit process. However, there is limited understanding of how technologies such as BDA are changing the way audits are being conducted. Thus, investigation is required of how the properties of BDA are influencing and configuring what auditors can and cannot do in the audit process and of the way relationships with other BDA users (data analysts) in audit firms are manage
CHAPTER 3. THEORETICAL FRAMEWORK

This chapter provides the theoretical framework for exploring the three research questions that this study focuses on. By their nature, the questions cover a holistic view of exploring BDA in audits of financial statements. The chapter identifies three distinct but related theoretical constructs which would be useful in navigating the empirical evidence collected for this study. These are ‘rhetorical strategies’, ‘identity regulation’ and ‘affordance’ and are used to understand the promotion, embedding and influence of BDA in audits. The first two constructs, rhetorical strategies (Suddaby and Greenwood, 2005) and identity regulation (Alvesson and Willmott, 2002), are drawn from NIT (Meyer and Rowan, 1977; Di Maggio and Powell, 1983), while the construct of affordance (Hutchby, 2001) is taken from its use in theoretical approaches to sociomateriality (Orlikowski, 2007; Leonard and Barley, 2008; Leonardi, 2011). Despite these constructs representing two distinct theoretical lenses, there have recently been calls for (Jones et al., 2017), and studies of (Raviola and Norback, 2013; Monteiro and Nicoline, 2015), the application of both types of theoretical construct to provide a richer understanding of phenomena by including the role of material objects such as technology.

In auditing research, studies using NIT to understand change in technology regard such change as institutional change (Curtis and Turley, 2007; Robson et al., 2007), in which both the auditors (firms) and technology (re-)shape the market for audits and audit practices. For example, Carpenter and Dirsmith (1993) used NIT to explain the changes that statistical sampling brought to the audit field in terms of rationalising the scope of audit evidence, as well as the nature of the monitoring of auditors by administrators. Similarly, Curtis and Turley (2007) and Robson et al. (2007) demonstrate how constructs from NIT, such as legitimacy, could be used to discuss how audit firms promote technology (BRA) within and outside the field, and how such technology can be used to shape auditors’ identity and the vocabulary used in the audit process. These studies show the role of technology in institutional change and also provide an understanding of the relationship between relevant stakeholders, in this case audit firms and regulatory agencies, professional bodies and clients, in particular how
actors shape, or are shaped by, the audit field. In this regard, audit firms are regarded as shaping and being shaped by, the audit field.

The survival of audit firms depends upon the way they conform to the standard of behaviour expected within the audit field. Given that there are so many actors in the field, firms actively engage in activities that could render themselves socially acceptable and desirable. Therefore, developments such as BDA could be regarded as part of the attempts by firms to respond to expectations given that, in this case, the environment is characterised by BD. However, bringing BDA into the audit field as a way of conducting an audit is not straightforward; audit firms have to convince the relevant stakeholders that BDA is socially desirable and appropriate in meeting the demands of external audits. Therefore, audit firms have to make sure that BDA acquires legitimacy from the relevant stakeholders, such as clients, regulators and standard setters. It is at this point that firms have to provide accounts of BDA that can convince the relevant stakeholders about BDA. Section 3.1 of this chapter provides the theoretical construct for understanding the legitimisation process for BDA in this study by analysing the rhetorical strategies being employed.

Further, from an NIT perspective, the practices that auditors perform during the audit have a profound effect on how they make professional judgements, because they are sometimes either prescribed in auditing standards or cognitively embedded. Such being the case, the introduction of new practices could lead to ambivalence in the way auditors view their work. Alternatively, firms could deliberately attempt to change auditors’ practices because they would like to attain legitimacy. Such a strategic move could bring challenges by affecting the established roles and practices of auditors, who attach meanings to the technologies they use and the practices that are performed during the audit which, over time, become taken for granted. Therefore, in NIT, understanding the identity of auditors as new practices emerge could be useful in exploring how audit technologies such as BDA are embedded in the audit process. Section 3.2 discusses identity regulation as a theoretical construct for addressing the embedding of BDA in that process.

Finally, the legitimising and embedding of BDA respectively within the audit field and the audit process both attend to the symbolic roles to which discursive strategies in rhetoric and
identity regulation give prominence in the theorisation of institutional change. Further, auditors use material objects when conducting an audit. Such material objects, which include audit technologies, have properties that can have an influence on the way they are embedded in practice. Sociomateriality and, specifically, its explication of what it calls “material objects” provide an analytical lens through which to study the effects of technology on the dynamics and outcomes of methodological change.

In this context, BDA effectively provides auditors with a material object that can facilitate or constrain the way they do their work. This can potentially affect their relationships as well as the type of expertise they need to possess. Given that BDA is endowed with certain properties that are required to be used or experienced by auditors, an understanding of the institutional context of auditing that ignores the role of BDA and its properties can undermine our understanding of BDA in audits of financial statements. Therefore, the construct of affordance has been imported from sociomaterial studies to overcome the limitations of NIT, which ignores the role of material objects and their properties in the re-configuration of practices and social spaces. Section 3.3 provides an account of affordance as a construct for understanding BDA and its properties in the auditing of financial statements.

This study benefits from such a complementarity of theoretical constructs to provide a deeper understanding of a nascent phenomenon like the emergence of the use of BDA in the audit field. Consistent with prior studies of institutional change, this study adopts NIT as the overarching theoretical lens, but incorporates the construct of affordance from sociomateriality approaches to overcome the drawbacks associated with NIT. Figure 3.1 demonstrates how the three constructs, discursive strategies, identity regulation and affordance, are linked.
3.1 Promoting BDA to stakeholders

3.1.1 Discursive strategies and legitimisation of BDA

In the previous section, it is argued that the social relevance of auditing depends on its ability to engender trust (Power, 1997) among key stakeholders in various social spaces (Power, 1994; Andon et al., 2015). Further, this study views trust in auditing not as a fixed and stable construct (Mennicken, 2010) but rather as precarious, especially in times of crisis (Sikka, 2009), and unstable in other contexts (Barrett and Gendron, 2006). To this end, when trust is compromised, the audit profession engages in efforts to negotiate and reconstruct it. Thus, “to legitimize its existence, the auditing profession has a vested interest in convincing users that accountants can be trusted” (Holm and Zaman, 2012, p. 52). This could involve, at a programmatic level, promoting or reworking ideas or goals which have relevance to the political rationality in the social milieu, such as independence and audit quality while, at a technological level, it could require either introducing or abandoning practices, which might demonstrate change, symbolising either technical superiority or inferiority, e.g. statistical
sampling (Carpenter and Dirsmith, 1993; Pentland, 1993; Power, 1997). Prior studies have shown that auditing has first to be legitimate before it can legitimise others (Power, 2003; Free et al., 2009; Andon et al., 2015) and also that such a process of legitimising the ideas or practices of auditing might produce unexpected outcomes (Fischer and Dirsmith, 1995; Shafer and Gendron, 2006). Therefore, as Mennicken (2010, p. 337) suggested, attention is focused on “instruments and activities of [audit technology, which this study suggests could include BDA] in which audit expertise is organized, staged and legitimised”.

With this backdrop, this section argues that the introduction of BDA into the audit field could be perceived as the means through which the audit profession is attempting to maintain social relevance in the audit environment which is now characterised by BD. To do so, BDA must first attain [pragmatic and moral] legitimacy before being taken for granted in the audit field (Suchman, 1995; Fischer, 1996; Power, 2003) and, in particular, during audits of financial statements. The purpose of this section is therefore to provide a theoretical framework through which such a process could be analysed, especially as audit firms engage in the production of legitimacy for BDA among relevant stakeholders. The objective is to address the first research question:

*What are the strategies audit firms employ to promote the relevance of BDA to relevant stakeholders?*

This section develops a conceptual framework for addressing the above research question and is structured as follows. Sub-section 3.1.2 draws on the concept of legitimacy (Suchman, 1995) to understand the dimensions of legitimacy which could be relevant for this study. Sub-section 3.1.3 then mobilises studies in auditing which have explored the notion of legitimacy in order to establish the strategies which auditors have used to attain it. The objective is to demonstrate that, as much as prior studies have provided rhetorical strategies through which the audit profession could gain legitimacy in other spaces and during crises, limited analytical attention has been given to the rhetorical strategies through which legitimacy of technologies used in the audit field is produced. In Sub-section 3.1.4, rhetorical strategies proposed by Suddaby and Greenwood (2005) are presented as the theoretical construct through which
audit firms are constructing the legitimacy of BDA among relevant stakeholders. Sub-section 3.1.5 provides a summary.

3.1.2 Legitimacy and its dimensions

The concept of legitimacy has been extensively researched in the field of auditing. Grounded in the ideas of NIT (Rowan and Meyer, 1977; Di Maggio and Powell, 1993), legitimacy relates to how organisations or certain practices are linked to the shared beliefs, norms, rules or standards of a particular environment. Several definitions of legitimacy have been provided but this study uses that of Suchman (1995, p. 374), who defined it as “a generalized perception or assumption that the actions of an entity are desirable, proper or appropriate within some socially constructed systems of norms, values, beliefs and definitions”. This holistic view of legitimacy points to the ability of an organisation or a practice to gain cultural support in a particular social space. Further, Suchman’s definition helps to understand legitimacy as something that is derived from a group of individuals or social referents who accept, without questioning, that actions of a particular individual or entity are in line with the established norms and values of such an environment. In auditing, legitimacy could mean that ideas about, or technologies for, the conduct of the audit are taken for granted by most of the relevant stakeholders in the field because they are regarded as desirable or appropriate (Robson et al., 2007).

In essence, legitimacy confers stability on an organisation and makes its activities comprehensible to the key audience (Suchman, 1995). Therefore, legitimacy as a concept is appropriate for explaining organisational behaviour and change because it offers rationales for an entity’s survival. The concept suggests that the actions and motives of the organisation are beyond technical rationality and include rationalised myths (Deephouse and Suchman, 2008) which should be understood as culturally embedded and politically driven. In this regard, legitimacy should not be viewed as something that can be exchanged or owned but rather as something reflective of cultural alignment and societal values (Scott, 1995). Likewise, in the context of auditing, Power (1997) and Pentland (1993) note that the significance of auditing is in its ability to provide not only technical knowledge and interpretation of how financial statements have been prepared but also cognitive comfort to
the clients as well as to the auditors themselves. Therefore, conduct of an audit is the performance by auditors of rituals in which rationalised myths are displayed to clients, their stakeholders and the public at large in exchange for economic benefits (Pentland, 1993; Jeacle, 2014; Whittle et al., 2016). Legitimacy can be both an operational resource strategically utilised to bring tangible results, such as economic benefits, and a driver of conformity with exogenous pressures from the environment in which an organisation operates, in order to avoid regulatory scrutiny and potential censure (Suchman, 1995). The latter has been referred to as an institutional view of legitimacy and the former as a strategic view. In this context, BDA may therefore be viewed as a deliberate attempt by audit firms to take advantage of their position in the field to make economic gains (strategic view) and/or a response to the changes in the generation, storage and use of data taking place in the environment providing a context for audit work (institutional view).

Dimensions of Legitimacy

Given that legitimacy requires and invokes different behaviours, Suchman (1995) identified three distinct but related dimensions of legitimacy. These are pragmatic, moral, and cognitive legitimacy.

Pragmatic legitimacy is gained when an organisation’s immediate audiences believe that its actions and programmes are developed in a way which best serves their interests. It also relates to how the organisation’s actions affect a broader political, social and economic milieu. Pragmatic legitimacy most closely relates to the programmatic realm of auditing (Power, 1997) and the need to ensure that its role, objectives and rules are deemed acceptable by the consumers of the audit product (clients and investors) as well as by society at large (politicians and public). Pragmatic legitimacy can be further categorised into three types, namely exchange, influence and dispositional.

Exchange legitimacy is the basic level of legitimacy whereby material exchanges between an organisation and the audience are evaluated because legitimacy is linked to an “organization’s capacity to achieve practical outcomes” in the context in which it operates.
(Suddaby et al., 2016). The support for a given organisational policy or practice is often based on the premise that it provides value to a given group of constituencies (Suchman, 1995). For instance, the promotion of BRA was based on the notion that clients would benefit from the value adding audits that were conducted to evaluate the risks that were associated with the business model and strategies, and that affected the financial statements (Knechel, 2007). Audit firms argue that it was in the best interest of audited clients to embrace BRA because the benefits extended beyond mere reporting that the financial statements show a true and fair view (Curtis and Turley, 2007).

In addition to immediate audiences (clients), auditors’ attempts to gain legitimacy may also target other groups, such as regulators. Studies by Robson et al. (2007) and Curtis et al. (2016) show how audit firms engaged in efforts to attain legitimacy from regulatory agencies for the construction of BRA. Suchman (1995, p. 578) names this form of pragmatic legitimacy as influence legitimacy. It requires co-opting “constituents into its policy-making structures or adopts constituents’ standards of performance as its own [with the purposes of obtaining their] ongoing commitment”. It could be argued that influence legitimacy is important in appealing to the political and social realms by demonstrating that actions of the entity benefit society in general and also relate to the political doctrine of the time (Holm and Zaman, 2012).

Finally, Suchman (1995) identified dispositional legitimacy as a third form of pragmatic legitimacy which is attained from an organisation’s individual standing in the environment. Here the persona of the entity is what enables legitimacy to be gained. An organisation with good standing in society would be seen as appropriate and its actions would be accepted as desirable. Here, the Big Four audit firms, by their nature as large audit firms, may have more personal appeal to their constituents regarding some matters than smaller audit firms (Van Buuren et al., 2014). For instance, Jeacle (2014) claims that Deloitte’s standing in the audit field enabled the legitimacy of the BAFTA awards to be enhanced among the relevant audiences. Similarly, Free et al. (2009) indicated that the introduction of KPMG to the verification and validation process added credence and legitimacy to the FT’s MBA rankings. Hence, an organisation’s success in achieving pragmatic legitimacy is directly derived from its ability to demonstrate that its internal norms and activities have practical consequences for the constituencies whose opinions it values. Further, pragmatic legitimacy can be acquired
and easily manipulated to meet the desired ends. Given that pragmatic legitimacy can be adjusted to reflect the target audience’s demands, it has a short term life span.

Suchman (2005) also identified moral legitimacy as a second dimension of legitimacy that “reflects a positive normative evaluation of the organization and its activities” (Suchman, 1995, p. 579). This means that an organisational activity or practice is judged by a relevant audience, not in terms of whether or not it brings certain benefits or is of general value, but in terms of whether it is the “right thing to do”, in other words, whether it corresponds to a set range of normative associations and values upheld in a particular social grouping.

Suchman (1995) identified four types of moral legitimacy, including consequential, procedural, structural and personal legitimacy. Consequential legitimacy reflects the normative evaluation of what the organisation achieves. Here, the normative dimensions of the output and its consequences are under scrutiny. For example, the actions of organisations in terms of the environment would be the object of legitimation. Consequential legitimacy could be very difficult to evaluate in auditing because the manner in which the output has been achieved is difficult for the public to determine. In this regard, Suchman (1995) explains that such organisations would be evaluated based on the procedures and techniques they use. This is called procedural legitimacy, which in Power’s (1997) terms, is the technological realm of auditing. According to Suchman (1995), attainment of procedural legitimacy involves efforts to adopt technological tools considered appropriate, effective and justified, including “identifying some methodologies as ‘science’ and others as ‘quackery’” (p. 580).

Therefore, procedural legitimacy becomes particularly significant in the absence of outcome measures. This is certainly the case for auditing in which the quality of the outcome (i.e. the auditor’s opinion) is difficult to evaluate due to the unobservable nature of the practice itself, leading auditors to adopt practices that “may serve to demonstrate that... [they are] making a good-faith effort to achieve valued, albeit invisible, ends” (Suchman, 1995, p. 580). Power (1997) contends that the ARM and statistical sampling are some of the technologies by which auditors provide a scientific and objective appeal in the conduct of the audit. Related to procedural legitimacy is structural legitimacy, in which legitimacy of the organisation is attained if “its structural characteristics locate it within a morally favored taxonomic
category” (Suchman, 1995, p. 581). It could be argued that, in auditing, procedures and structures could be used interchangeably. For instance, the use of statistical sampling was part of the quest to promote formalism and structured audits for easy verifiability and control (Carpenter and Dirsmith, 1993; Power, 2003). Therefore, much as technological tools are used to aid efficiency in the conduct of the audit through formalism, they can also be used as rationalised myths to provide a scientific image of the way in which audits are conducted. Doing so would enhance both structural and procedural legitimacy enabling the actions of the organisation to be deemed as normatively compliant.

Finally, Suchman (1995, p. 581) introduced a fourth type of moral legitimacy, called personal legitimacy, which “rests on the charisma of individual organizational leaders”. This type of legitimacy is associated with charisma and other personal attributes which society relates to moral standing.

*Cognitive legitimacy* is the third dimension of legitimacy and is, according to Suchman (1995), the ultimate and most difficult to achieve form of legitimacy. It involves acceptance of an organisation or organisational practice as necessary and inevitable (Suddaby et al., 2016). This type of legitimacy is based on cognition and recognition of the taken-for-granted status of the organisational practice, rather than on its evaluation or the self-interest of relevant constituencies, as with the other two dimensions of legitimacy.

It should be noted that the pragmatic, moral and cognitive dimensions of legitimacy co-exist with and, in some cases, contradict one another. For example, an audit firm’s efforts to legitimise the provision of non-audit services as part of adding value to the client (pragmatic legitimacy) could be undermined by any perception of a poor audit process or of a lack of independence on the part of the auditor (moral legitimacy), which may threaten the overall legitimacy of the audit profession (Sikka, 2009). In contrast, provision of assurances services could be deemed to enhance auditors’ understanding of clients and their environments for audit purposes, thereby improving the identification of risks in the audits of financial statements (Robson et al., 2007). This observation also points to co-habitation of pragmatic and moral legitimacy which, according to Suchman (1995), are short-lived and need constant reinforcement. Cognitive legitimacy may take time to be attained but has an influence on the
evaluation of moral and pragmatic legitimacy. Therefore, in terms of institutional change, which is relevant to this study, pragmatic and moral legitimacy would largely be the focus because the promotion of BDA is deemed to be in its infancy (IAASB, 2016a; FRC, 2017). Given that pragmatic and moral legitimacy tend to be associated with the inception of the legitimisation process, it is inevitable and more likely that they would be captured in the discourse that firms have been initiating, since both legitimacies “[rest] on discursive evaluation” (Suchman, 1995, p. 585).

3.1.3 Legitimacy in the context of auditing

Studies on legitimacy in auditing can be divided into two distinct but related streams. On one hand, there are studies that seek to investigate auditing as a mechanism for producing legitimacy (Power, 2003; Free et al., 2009; Andon et al., 2011), while on the other, there are those that attempt to understand how auditing seeks legitimacy (Pentland, 1993; Fischer, 1996; Robson et al., 2007). However, within the two strands, the pragmatic and moral dimensions of legitimacy have been widely explored. Studies of cognitive legitimacy are rare, but when it has been studied, it has been presented as coalescing from pragmatic and moral legitimacy (Suddaby and Greenwood, 2005; Robson et al., 2007).

It is noted that the processes of producing and seeking legitimacy co-produce each other (Power, 2003) because, as auditors seek legitimacy (Warren and Solomon, 2014) they are also producing it (Free et al., 2009), thereby attaining a relevant role in society. Therefore, the terms “seeking” and “producing” are used interchangeably in this context with each reflecting both the seeking of and the producing of legitimacy. In this study, the focus is on dimensions of legitimacy and the strategies for securing it in particular spaces. Therefore, the limited number of studies on legitimacy in auditing presented in this section are meant to provide insights into the process and means of securing legitimacy, thus highlighting the ongoing contributions in this area and also helping us with understanding the framework within which research question 1 is addressed.

In auditing, on one hand, there are some studies investigating the ideas, programmes and concepts of auditing, and how they are circulated and used to maintain or defend the
legitimacy of the audit profession (Mennicken, 2010; Holm and Zaman, 2012; Whittle et al., 2014, 2016) and other domains experiencing challenges (O’Dwyer et al., 2011; Jeacle, 2014). On the other hand, there are studies that focus on audit technologies, in particular how auditors either secure legitimacy for such technologies or how such technologies are used to help auditors (Robson et al., 2007) and others secure legitimacy (Free et al., 2009). The latter studies connect the conduct of audits at the micro-/technological level to concepts and ideas being promoted at the programmatic level.

**Securing legitimacy through ideas and programmes of auditing**

In cases where legitimacy is sought using ideas and programmes of auditing, studies have shown that this is most common following a crisis. Therefore, firstly in this sub-section, studies are presented that explore how ideas or programmes of auditing are used to regain the legitimacy perceived to have been impaired in the aftermath of the crisis. Second, studies that have shown how ideas and programmes of auditing have been exported to other domains to either repair or construct legitimacy are covered.

In the audit field, Whittle et al. (2016) investigate the ways in which Big Four audit firms attempted to restore their legitimacy in the aftermath of the banking crisis. In doing this, they drew on deliberations that took place when the House of Lords Economic Affairs Committee summoned the senior managements of the Big Four to provide an account of their role in the crisis. The interaction between the committee and the Big Four was a public display of the ideals of auditing, namely auditors’ independence, fairness, truth and public service, which were questioned as part of the politicians’ efforts to de-legitimise the social relevance of auditing. Here, auditing as an instrument of governance to monitor and control banks in a neoliberal market was in doubt (Lee, 1993). In other words, politicians felt that auditors had failed to meet the political rationality associated with market economies; in particular, the committee exposed “reality disjunctures” to demonstrate variance between what auditors claim to do and what they actually do. Therefore, the firms were asked to account for their role in the banking crisis. Responding to the committee’s claims, the Big Four used the platform to make a case for their role as custodians of accountability in order to restore moral
legitimacy and also to expose some of the deficiencies in the regulatory guidance governing the conduct of the audit, thereby shifting the blame to politicians. Drawing from the same empirical evidence, Whittle et al. (2014) note that these firms used rhetoric as a strategy to put their case across. They argue that, despite being commercially oriented through the provision of consultancy, auditors claim to “rise above the fray” (p. 800) in the way they conduct the audit, in order to appeal to the ideals of independence and professionalism.

The aforementioned studies relate to securing legitimacy from politicians. In a similar vein, Holm and Zaman (2012) present a case of how legitimacy was sought from regulators. While regulators could be seen as part of government, their exposure to auditing matters could be perceived differently from that of politicians. In this study, the FRC (2006), through the discussion paper “Promoting audit quality”, engaged with relevant stakeholders, namely clients, professional bodies and auditors, as part of corporate governance reforms to find ways of promoting audit quality, which was perceived to be deficient following the collapse of large companies such as Enron, WorldCom and the audit firm, Andersen. Consistent with Whittle et al. (2014, 2016), they argue that the audit profession “aligned themselves with the audit quality rhetoric to legitimise themselves and protect their image” (p. 52). Again, audit firms used this platform to problematise the status of the FRC’s conceptualisation of audit quality in official guidance. They requested the inclusion of more market-based measures which were less prescriptive regarding auditors’ judgements. Here, auditors displayed the image of professional expertise as a means to be trusted again. They further wanted to appeal for moral legitimacy, suggesting that the attainment of audit quality also involves interaction with the audit committee.

Therefore, the studies on the producing of legitimacy where the social relevance of auditing is at stake may partly involve an appeal for moral legitimacy, in which normative assertions such as auditor independence, fairness and audit quality are promoted in public displays aimed at those charged with overseeing political rationality. Also, convincing the political establishment involves the audit profession (regulators, professional bodies and audit firms) downplaying pragmatic legitimacy, in particular the exchange dimension, which is grounded in materialistic economic benefits such as profit, as noted by Holm and Zaman (2012, p. 57),
who state that “neither the FRC nor the professional bodies attach much weight to how the profit motive of audit firms might undermine audit quality and contribute to failures.”

While auditors have to deal with efforts to secure the legitimacy of their profession in times of crisis, other domains also rely on ideals and programmes of auditing to acquire legitimacy. Termed as “the audit explosion” (Power, 1994), the ideas of auditing have been imported to other areas of social life in which issues of trust and accountability are at stake.

**Securing legitimacy through changes in audit technology**

Some studies demonstrate that audit technologies can be used to legitimise programmes or ideas of auditing (Robson et al., 2007; Andon and Free, 2014) by linking the programmatic and technological levels of auditing (Power, 1997). The purpose is to show that these technologies would either benefit the relevant stakeholders in achieving their goals (see Robson et al. (2007) for BRA) or represent appropriate means of getting things done (see Free et al. (2007) for MBA rankings). Similarly, other domains employ audit technologies to promote an image of rationality in the way they conduct themselves or to promote particular programmes (see Gendron et al. (2007) on New Public Management).

Prior studies show that audit technologies are attached to the shared norms and cultural values of the audit field so that they appear appropriate and desirable. This involves identifying key stakeholders in the field, namely regulators, standard setters, professional bodies and educators, to whom to promote the technology. Robson et al. (2007) show that BRA was presented as addressing some of the key issues (e.g. failure to detect management fraud) affecting audit firms’ failure to understand business risks and add value to their clients. Failure to provide credible audits was problematised in the context of a lack of audit technology that could provide a strategic lens for auditors to evaluate clients’ business affairs and that could also be economically viable for the firms. BRA was seen as addressing both the business and regulatory side of providing value adding audits. Therefore, audit firms sought pragmatic legitimacy by engaging with educators and professional bodies to circulate BRA in the field as the solution to the problems experienced by auditors owing to the complexity of
the business. Using the vocabulary of risk management, which was institutionalised in the environments where audits were taking place, educators and professional bodies portrayed auditors as business consultants who would provide not only an attestation function but also economic value to the business. It could be argued that audit firms co-opted educators and researchers so that they could have influence on the development of BRA while, at the same time, through their publications they acquired exchange legitimacy from the clients. While audit firms co-opted educators and professional bodies to promote pragmatic legitimacy, they also engaged with regulators and standard setters to promote moral legitimacy. Here, BRA was presented as addressing the problem of evidence collection and evaluation, and also as addressing the unresolved issue of auditor independence through the provision of a consultancy type service.

Investigating the same technology, Curtis and Turley (2007) noted that, in pursuit of pragmatic legitimacy, audit firm administrators had to convince audit practitioners of the value of using BRA in their audits. This proved problematic because practitioners were concerned with how BRA would affect their professional standing in the audit process. In other words, production of moral legitimacy was required. This shows the importance of appealing to key wider audiences for legitimacy, a point which was later illustrated in O’Dwyer et al.’s (2011) study on audit firms’ assurance of sustainable reporting. This study, which provides an account of the audit profession annexing other fields, shows the importance of conforming to the existing needs and prevailing moral values of the key stakeholders when new technologies are being introduced. It also highlights legitimacy as a calculative endeavour in which its production requires manipulation of the audience and the message being communicated. Here, it was observed that failure to secure pragmatic legitimacy within the firm meant that legitimacy had to be manipulated to appeal for moral legitimacy by bringing in the accountant, who acted as the mediator between disagreeing parties (the firm and the risk department). This shows that audit technologies require co-production of moral and pragmatic legitimacy to be culturally valued, for example by portraying audit technology as promoting efficiency and effectiveness (Fischer, 1996). However, Curtis and Turley (2007) show that this can be challenging. The process of acquiring legitimacy both in auditing and in other spaces is not unproblematic.
Previous research (Shafer and Gendron, 2005; Barrett and Gendron, 2006; Curtis and Turley, 2007; Mennicken, 2010; to name a few) has shown that the ideas of auditing, or the importing of technology from other spaces into the auditing space, may be challenging and may require careful consideration of context and key audiences. Mennicken (2010) exposed these challenges during an investigation of the transition of auditing from state to market driven approaches in Russia. In her study, much as the idea of auditing embraced at a programmatic level was market driven, the actual conduct of audits did not depart significantly from the state backed approach. Auditors portrayed themselves as solutions to problems associated with the old political rationality (Communism) but such a portrayal did not translate to change in technologies and practices on the ground. Equally, Curtis and Turley (2007) observed that BRA, despite it being portrayed as an ambitious programme of change in the audit field, was deemed ambiguous at the practice level. Consequently, the legitimisation process was problematic and delivered an unintended outcome in the form of a lack of real change in evidence collection.

While Mennicken (2010) and Curtis and Turley (2007) provide evidence of loose coupling between the programmatic and technological levels of auditing, Gendron and Barrett (2004) highlighted the importance of a stable and strong network of supporters. They found that the failure of audit expertise in cyberspace was a result of a lack of personal interaction with clients, which is a hallmark of traditional audits (Pentland, 1993), thus inhibiting auditors from convincing key stakeholders that they also have jurisdictional and technical expertise in cyberspace. In doing so, a network of supporters was not cultivated to facilitate the legitimization process. Similarly, the lack of stable and solid networks was exhibited in Shafer and Gendron’s (2005) study, in which AICPA wanted to create XYZ credentials, which were meant to give auditors autonomy and legitimacy to offer a plethora of consulting and business services besides those relating to financial audits. The study finds that the professional body failed to convince members that the credentials were appropriate and desirable in the socio-political context in which they were being promoted (the collapse of Enron and the audit firm, Andersen, the enactment of the Sarbanes-Oxley Act in 2002, among others), thereby failing to secure pragmatic and moral legitimacy. This study also demonstrates the tensions between pragmatic and moral legitimacy in the profession’s quest to address regulatory concerns and
remain competitive within the cognitive construct of a professional auditor with a market-based mindset.

Overall, the literature provides empirical support showing that the process of gaining legitimacy is precarious and requires a strategic approach. In this regard, audit firms have to demonstrate that technologies like BDA address the needs of a specific audience as well as the wider audit field. To achieve this, different discursive strategies are employed aimed at securing moral and pragmatic legitimacy. In broader terms, BDA has to be linked to existing cultural values of auditing, such as independence and audit quality, and also to the political rationality of the time. Further, it has to be shown to immediate constituents that BDA would provide specific economic benefits to clients, and that the interests of wider stakeholders in the audit field, such as regulators, have been considered, thus appealing to pragmatic legitimacy. Beyond this, audit firms have to show that using BDA is the right way of doing audits of financial statements. As part of audit procedures, BDA is better than existing methods in providing images of rationality and is quasi-scientific, as was the case with the ARM and statistical sampling (Abbott, 1988; Power, 1997). Therefore, constructing convincing accounts connecting audit technology to the ideals of auditing, as well as representing it as quasi-scientific, require the strategic use of discursive practices in the form of rhetoric. Such rhetoric should be aimed at appealing to pragmatic and moral legitimacy.

3.1.4 Rhetorical strategies of legitimisation

Rhetoric is regarded as the means of persuading others through the use of language (Alvesson, 1993; Suddaby and Greenwood, 2005). In the context of production of legitimacy in auditing, studies have documented various ways in which rhetoric has been used to promote either ideals or technologies of auditing. In many cases, the rhetoric is framed in such a way that auditing problematises the context in which it intends to offer solutions (Power, 1996; Shafer and Gendron, 2005; Robson et al., 2007). However, the rhetorical approach differs according to the stakeholders being targeted. Some studies (Holm and Zaman, 2012; Whittle et al., 2014, 2016) have had to use the blame game as the rhetorical approach to defending the audit profession. It was demonstrated that auditors had to expose weaknesses in the regulatory guidance (auditing standards) and client’s governance
structures (lack of participation of the audit committee) to shift the blame to politicians and regulators. The same mechanism was also employed in Andon and Free’s (2014) study on the salary cap crisis, in which auditors and accused rugby clubs blamed the issue of salary cap breaches on the problems affecting the governance of rugby in Australia. Nevertheless, auditors accept a stake in the crisis which eventually and paradoxically means auditors themselves are both the catalysts and the pharmakoi (sacrificial lambs) in the cleansing process that solves the crisis (Guénin-Paracini and Gendron, 2010). The blame game can be seen as a strategy to preserve moral legitimacy.

In cases where the audit profession is attempting to expand its jurisdiction, the focus of rhetoric is on demonstrating that auditing, as a form of knowledge, is both relevant to, and superior in, that new social space (Power, 1996). Here, the key audiences are either clients or members of the profession. Shafer and Gendron (2005) note that, in the promotion of the broad based credentials of XYZ, AICPA had to convince members from multiple professional bodies. Given that what was being promoted was meant to create a new professional identity for auditors by transforming the existing one into a business consultant, the rhetoric was very abstract. The knowledge required for the credentials and roles to be performed was presented highly abstractly. They note that this amount of abstraction “rendered tenuous the link between (accounting/auditing) knowledge and outputs, thereby weakening the persuasiveness of the knowledge claim in enrolling the audiences” (p. 480). This study highlights the challenges associated with reconciling the rhetoric of securing moral and pragmatic legitimacy among members of professional bodies among whom ambivalence is evident in the promotion of both commercial and professional logics.

To overcome the problem of abstraction of knowledge and roles, Suddaby et al. (2015) provided an account of how social media can be used as a rhetorical strategy to promote the image of auditors as business consultants. Here, social media like LinkedIn® gives auditors the platform to show clients as commercially oriented and willing to offer value to their own clients. This approach resonates with pragmatic legitimacy. Similarly, the rhetoric used in securing the legitimacy of audit technology, though limited, appears to frame it as technically superior to the current technologies in addressing the existing needs of the key audiences (see Robson et al. (2007) on BRA).
However, studies of strategies for securing legitimacy have so far been very much interested in the rhetoric used in defending the audit profession in a crisis (Shafer and Gendron, 2005; Holm and Zaman, 2012; Whittle et al., 2016) as well as that used in legitimising auditing and relevant technologies in other domains (Suddaby and Greenwood, 2005; O’Dwyer et al., 2011; Andon and Free, 2014; Suddaby et al., 2015). Understanding of the rhetoric used in the production of legitimacy for audit technologies in the audit field is very limited. To date, only Robson et al., (2007) have addressed the issue, with minimal focus on the language that audit firms employ to promote BRA to clients. Their focus was on promotion of BRA to regulators, educators and standard setters as key audiences. To further investigate rhetorical strategies, philosophical underpinning of such rhetoric should be explored to understand how change is theorised to uncover the motives and interests of those making a claim. Suddaby and Greenwood (2005) provide an account of how change was theorised with rhetorical strategies that have philosophical foundations in order to understand changes to the organisational form of audit firms in becoming multi-disciplinary professional firms. This study acknowledges that firms are using developments in BDA to play “an ever more central role in the restructuring of work, both rhetorically and practically, across both organizational and national boundaries” (Covaleski et al., 2003, p. 323). Therefore, the next sub-section provides a framework for understanding the promotion of BDA in the audit field by identifying the nature of rhetoric being used to theorise the change in the field associated with BDA. Doing so might assist in understanding the motives and dimensions of legitimacy being sought. The focus is on the “accounts of the process by which the assumptions that [are promoted with regards to using BDA in financial audits] are contested and changed” (Suddaby and Greenwood, 2005, p. 36). To date, the current literature provides partial accounts of such a process in audit technology. For instance, Robson et al. (2007) provide an account of how BRA was promoted while Curtis et al. (2016) provide another dimension of how BRA was contested in the regulatory arena involving standard setters. In contrast, this study attempts to bring such accounts together. Therefore, in the next sub-section, the theoretical framework which is used to analyse research question 1 is articulated. It draws from rhetorical strategies identified in Suddaby and Greenwood (2005).
Theoretical construct: rhetorical strategies

Suddaby and Greenwood (2005) identified the interlacing of institutional vocabularies and theorisation of change as rhetorical strategies which can be used to understand how new practices or technologies are legitimised in a social space such as the audit field. In their study of the process through which change in organisational form from audit firms to multidisciplinary professional firms was secured, they defined rhetorical strategies as “the ways in which the meaning systems that underpin institutions are manipulated” (ibid, p. 60).

Suddaby and Greenwood (2005) note that institutional vocabularies which are associated with existing institutional logics in a particular field can be deliberately exploited to uncover inherent contradictions. In this context, there exist professional and commercial logics in the programmatic realm of auditing (Power, 1997, 2003; Malsch and Gendron, 2013). Within these logics, institutional vocabularies of audit quality, independence and professional judgement are used to appeal to professional logic, while the institutional vocabulary of adding value is used to reflect commercial logic (Robson et al., 2007). Prior studies have demonstrated that audit firms struggle to maintain professional and commercial logics because of pressure from regulatory agencies (Holm and Zaman, 2012). According to Suddaby and Greenwood (2005), instigating institutional change involves audit firms’ use of contradictory institutional vocabularies to expose difficulties or challenges in the institutional logics. Therefore, to promote BDA, audit firms have to identify institutional vocabularies that could indicate contradictions or deficiencies in the institutional logics of professionalism and commercialism. These vocabularies could include deficiency in audit quality (Khalifa et al., 2007) or the need to provide value to clients (Covaleski et al., 2003; Robson et al., 2007, among others).

Suddaby and Greenwood (2005) state that the identification of institutional vocabularies to expose contradictions is not sufficient to convince key stakeholders in the field of proposed changes. Since introduction of new technology entails an aura of uncertainty, there is a need to theorise change whereby actors use “linguistic devices [to] manipulate the degree of uncertainty implied by innovation” (p. 59). To this end, audit firms have to employ rhetorical strategies in such a way that the proposed change or new technology connects to broader
cultural values or addresses the contradictions exposed through the institutional vocabularies. In this vein, Robson et al. (2007) and Curtis and Turley (2007) showed how BRA was linked with addressing the problems associated with audit evidence as well as the economics of auditing. The same point was made in Dirsmith and Carpenter’s (1993) study on statistical sampling. Theorising change implies giving legitimising accounts that link BDA to providing quality audits and adding value to the clients.

Suddaby and Greenwood (2005) identified five types of argument which can be used as rhetorical strategies for making a compelling case for the proposed change. These strategies represent rhetorical instruments of persuasion that may target members of the organisation itself as well as a broader range of stakeholders in the organisational milieu. These are ontological, historical, teleological, cosmological and value-based rhetorical strategies.

Ontological strategies involve making statements based on prior understandings about what can or cannot exist, including notions of, for example, compatibility or incompatibility. In this regard, the process of change is provided through underlying world views. For example, the rhetoric is framed to show that commercial and professional logics are distinct and any technology being promoted, such as BDA, which is trying to blur the boundary between them, is either contradictory to the existing ideals of auditing or provides the benefits that the profession or clients need. In many cases, ontological arguments are presented when opposing change in favour of maintaining the status quo (Shafer and Gendron, 2005), but can also be used to show that technology can facilitate the co-existence of competing logics (Robson et al., 2007).

Historical legitimisation challenges ontological rhetoric in the sense that it presents a proposed change as part of evolutionary developments and a certain path dependency while preserving tradition. The aim is to adopt a conservative approach to the proposed change, since abrupt change can be risky, and to consider uncertainty in outcomes and responses from key audiences. Historical argument in the promotion of BDA could require its introduction alongside continuing to use existing technologies such as statistical sampling to demonstrate caution and alignment with existing institutions. It could also relate to the audit profession using its history of providing accountability and relevance for financial statements.
as a means of legitimising their social relevance in a particular field (Power, 1996; Covaleski et al., 2003).

*Teleological* legitimisation focuses on a “divine purpose” or ultimate goal and creates a sense of urgency to accomplish such an objective. While historical arguments propose a gradual pace to change, the teleological approach is radical and revolutionary. The aim is to break from past tradition because it is regarded as undesirable for the future. Robson et al. (2007) portrayed BRA as a revolutionary approach to evidence collection and risk assessments. In this context, proposed new technology or practices are regarded as technically superior to existing ones in fulfilling the institutional logics. Thus, BDA would be evaluated against institutionalised technologies such as statistical sampling and presented as far superior, requiring instant adoption.

*Cosmological* reasoning emphasises change as a natural consequence of certain developments or events and underscores its inevitability. It presents change as something that will happen, whether planned or not. Exogenous factors are presented as de facto powerful causes of the change, suggesting that the change is not internally driven. Those opposing the change are cautioned against the dangers of such resistance, since their efforts would yield nothing, but could threaten the existence of the profession. Linking this to BDA, cosmological rhetoric would suggest that developments in BDA are inevitable because the environment is experiencing BD, so the profession has to adapt, otherwise it would be deemed irrelevant.

Finally, *value-based* strategies may construct links between proposed changes and both wider societal belief systems and more utilitarian gains and benefits for target constituencies. They focus on the personas of those making claims for proposed changes. This places adherence to a value system as a precondition for any proposed change. Here, the target of the rhetoric is the subject, not the object, and is thus the calibre of the audit firms or professional bodies making the claims about the relevance of BDA for auditing financial statements.

The five types of rhetorical strategy can reinforce, as well as contradict, each other, depending on the audience being targeted. The role of agency in all but cosmological rhetoric is very
visible suggesting the calculative nature of rhetoric. Suddaby and Greenwood (2005) note that teleological rhetoric appeals to pragmatic legitimacy while the rest are linked to moral legitimacy. In this study, no assumptions have been made a priori because it could be argued that, say, ontological or historical rhetoric can be used to secure both moral and pragmatic legitimacy. Such is the case since the context in which BDA is promoted is not confrontational as was the case with Suddaby and Greenwood (2005).

In this research, rhetorical strategies have been examined to explore how BDA is being promoted to relevant stakeholders in this way. Cosmological and teleological arguments are evaluated in order to establish how the audit firms are attributing the source and pace of change. Further ontological and value-based arguments provide a means of establishing the provision of audits and consultancy-type services that are captured when promoting ideas of BDA. Further, value-based rhetoric is also used here to assess how BDA aids the realisation of material benefits for either audit firms or clients. The rhetoric goes beyond the normative justification of BDA as well as the utilitarian view of it. The historical argument, meanwhile, tries to link BDA to previous developments in auditing and also to the privileged position of auditors as gate keepers of trust. This could also relate to how auditors justify their expertise as encompassing the use of BDA in an environment in which other players, such as technology firms, are also claiming similar expertise. Considering that rhetoric is context dependent and is also a political endeavour, challenges associated with BDA are also explored to establish how rhetorical strategies and other mechanisms are used to address the challenges. As this framework (see Figure 3.2) relates to promotion of BDA outside of firms, consideration in subsequent chapters is given to understanding how BDA is embedded within the audit function and to understanding its transformative effects as auditors interact with it.
3.1.5 Summary

In this study, rhetorical strategies are used to understand how audit firms are promoting and justifying the use of BDA in audits of financial statements, in particular how institutionalised vocabularies in the audit field, such as audit quality (Khalifa et al., 2007), are being framed within the discourse of BDA to demonstrate the novel way of conducting an audit, as well as
instigating the change that is being promoted. The aim is for audit firms to acquire moral, pragmatic and cognitive legitimacy.

3.2 Embedding BDA in the audit function: identity regulation

Prior sections include attention to the production of legitimacy for auditors at the practice level in order to understand the implementation process of BDA within the audit function. Given that audit firms are promoting BDA as a better, transformational way of conducting audits of financial statements, there is a need to explore how these firms are embedding this within their own ranks. This study also offers an alternative understanding of the implementation of BDA within the audit function. It views change in audit methodology as requiring auditors to reconsider their roles and how they want to be seen by others in the light of such new methodology or technology. The aim of firms in changing technology, apart from changing audit procedures, is to trigger identity work (discussed later in Sub-section 3.3.2). In other words, changes in audit methodology introducing new technologies, such as BDA, are mechanisms through which audit firms attempt to reconstitute the identity of auditors in a particular time and space (Robson et al., 2007). Investigating the implementation of BDA from this perspective is very important, firstly because exploring the means of identity formation in this context offers an alternative rationale for understanding the challenges and problematic nature of implementing audit methodology (Curtis and Turley, 2007) and technology (Fischer, 1996). This is important because it can be argued that when an existing technology is changed or replaced (Fischer, 1996), auditors’ identities, which are based on “previously established notions of time and space [being] deconstructed and the individual feel[ing] disoriented and confused” (Kornberger et al., 2011, p. 517). Secondly, it addresses the lacuna in the literature on identity work among auditors during change in audit methodology. Previous research has focused on constructs such as professionalism, client service and career (see review in Kornberger et al. (2011)) to explore identity (re)construction among auditors, but this study investigates how changes in audit methodology is implicated in the construction of identity through the introduction of technology within the firm. Robson et al. (2007) argue that BRA “methodologies potentially offered higher prestige and a new identity for auditors more consonant with the other functional identities of the large professional service firms (Ibid. p. 421)” The status of auditors was perceived to be enhanced
if they were generating more profits and that could only be achieved if they were also performing management consultancy.

Robson et al. (2007) suggested that audit firms wanted auditors to see themselves as more than auditors and to become business advisors when interacting with clients so that business opportunities in the form of consultancy work could be exploited. While this position may not be consistent with the regulatory frames governing external audits, it was perceived within the value system of auditing to be what clients were expecting auditors to do as part of the value adding endeavour. Unfortunately, Robson et al. (2007) do not provide a detailed account of how audit firms encouraged auditors to see themselves as business advisors. This is important considering that Curtis and Turley (2007) have attributed problems associated with implementation of BDA to “administrators who... did not give adequate consideration to the role of audit methodology”. They argue that, “in trying to reengineer the business model, administrators gave inadequate consideration to the organizational structure of the firms and the manner in which this structure supports the production of legitimacy”.

Therefore, this lack of understanding of how change in audit methodology is implemented through identity formation is the focus of this study. Here, the implementation of audit technology (BDA) is conceptualised as the means through which auditors are encouraged to reflect on their identity as they conduct audits in the data driven environment. In this regard, prior studies on the implementation of audit technology have either provided descriptions of steps in the audit process that could be deemed as changes to audit methodology (Cooper and Turley, 1991; Curtis and Turley, 2007) or they have investigated the actual use of technology. The aim of the latter studies is to establish how new audit technology provides comfort to auditors in the field (see Pentland (1993) on working papers) and also how the benefits of technology are socially constructed (Fischer, 1996; Curtis and Turley, 2007) for that technology to be regarded as legitimate.

These studies do, however, highlight the challenges associated with implementation of audit technology which, in many cases, arise from auditors being unsure of the effects of the technology on their image as auditors. Nevertheless, prior studies contribute to the present research (see Kosmala-Maclullich (2003) for example) in their recognition that technological
changes have implications for the identity of auditors and audit firms (Robson et al., 2007), thereby placing audit technology at the epicentre of identity construction for auditors. Thus, the way auditors see themselves when using a particular technology could have an effect on the way that such technology could be legitimised in the audit process (Fischer, 1996).

It could be argued that, apart from practical changes in the conduct of an audit, periods of methodological disruption also require auditors to revisit, often in a fundamental way, their professional roles and identities. Studies of the dynamics and consequences of methodological innovations in auditing should pay attention not only to the changes required in the practical conduct of an audit but also in auditors’ “professional selves” and the means through which they are encouraged to adopt the new technological demands. Developing such an understanding is important because, as argued by Curtis and Turley (2007) with reference to BRA, problems with the embedding of technological innovations often stem from the firms’ and their administrators’ failure to give adequate consideration to the role of audit methodology, including ways in which it requires auditors to reconsider their professional identity in order to be able to adapt to these innovations. This section therefore intends to provide a theoretical construct which could help in understanding the implicit and explicit means of embedding BDA in the conduct of audits as the platform through which firms encourage auditors to redefine their roles and identity. By doing so, it offers a lens to address research question 2:

*What means do audit firms use to embed BDA in the conduct of the audit?*

To answer this research question, this section draws on Alvesson and Willmott’s (2002) theorisation of identity regulation as a navigation lens to establish how the embeddedness of BDA in the audit process is achieved in practice. In order to conduct identity regulation, discursive practices are employed. Therefore, this section sheds light on how identity regulation can be understood as a means of organisational control (over audit work). It also shows how the discourse on the usefulness of BDA as a new, superior way of doing an audit can be translated into everyday choices, actions and practical routines involved in the conduct of an audit. The knowledge of these dynamics is important for our understanding of the
nature of auditors’ responses to the evolution of audit technology and sources of potential resistance.

The remainder of this section is organised as follows: Sub-section 3.2.1 discusses identity-related implications of changes in audit methodology. Sub-section 3.2.2 presents the concept of identity regulation, which will be used to understand how audit firms are embedding the use of BDA in the audits of financial statements. Sub-section 3.2.3 provides the summary.

3.2.1 Changes in audit technology and the search for a new identity

The literature has shown that changes in audit methodology have corresponded to particular discourses prevalent at the time (statistics and strategic management) and that particular practical solutions to accommodate these changes were constructed around such discourses (Carpenter and Dirsmith, 1993; Robson et al., 2007). For instance, it has been documented that statistical sampling was introduced in auditing at the time when statistics as a scientific profession was gaining popularity. System-based audit was being promoted against the backdrop of a more scientific technique, “statistical sampling”. Auditors were encouraged to use statistics as a body of expert knowledge in their audits, as this was the prevailing discourse at the time (Carpenter and Dirsmith, 1993). As suggested in Chapter 2, the use of statistics in audits has been described as a means through which the audit profession wanted to appear scientific in the way it conducted the audit process (Power, 1997). Several publications on statistics populated the audit field as a means of mobilising the ideas of statistics (Matthews, 2006b). The identity of auditors could have been regarded as systems analysts at the time because the focus was very much on the design of a client’s internal control and compliance with that design. Statistical sampling provided the means through which auditor’s identity could be seen as achieving this role.

Similar observations are seen in the promotion of the risk-based auditing approach from the late 1980s, in which the discourse of risk management provided the vocabulary through which audit firms rationalised and achieved the use of the ARM (Power, 1997) as a means of determining audit evidence. That does not mean to say that statistical sampling was ignored, but rather it was embedded in the calculation of risk associated with the audit. Auditors could
have been viewed as risk analysts in this time and space. In fact, Robson et al. (2007) suggest that the plethora of business models being taught in business schools promoted the discourse of strategic management and adding of value, which provided the new approach to auditing. Further, this approach was being promoted at a time when the audit profession engaged in a project (the AICPA global credential project) which could have seen auditors designated a role that could have made them deal with various aspects of the business (Shafer and Gendron, 2005; Robson et al., 2007). During this time, auditors again had to adapt to new roles and identities, such as those of strategy analysts or business advisors, who not only could perform audits but could also give business advice. Figure 3.3 provides the conceptualisation of change in audit methodology as the interaction between change in methodology, audit technology and auditors’ identity.

Figure 3.3 The link between audit methodologies and auditors’ identity

In this regard, the developments in BDA should be viewed as an opportunity for audit firms to encourage their auditors to reinvent themselves in a data driven environment and as a means of triggering identity work. This identity work is therefore co-constructed through technology as well as through the prevalent discourse of BD. This process requires the intervention of audit firm administrators (Fischer and Dirsmith, 1995; Curtis and Turley, 2007) through various mechanisms as part of management control.
Organisations, including audit firms, have goals which have to be fulfilled in order to survive. Administrators within audit firms regularly institute mechanisms that are geared towards making sure that the internal arrangements of the firms are capable of handling the pressures exerted by external forces (Zaman and Holm, 2012). Thus, forms of organisational control are implemented to ensure that firms are able to adapt to changes in regulatory demands as well as to competitive and technological challenges. Kunda (1992) noted that, over the years, organisational controls (in the USA) have been shifting form, from rational to normative.

Rational controls involve putting in place mechanisms that streamline the operations within organisations in a manner that satisfies employees’ self-interest, whereas normative controls require management to attend to controlling employees’ behaviour as well as their emotions. Covaleski et al. (1998) demonstrated how both rational and normative controls were applied in the Big Four firms through programmes such as Management by Objectives (MBO) and mentoring. Their study revealed that MBO was a means of disciplining auditors so that they should achieve the stated goals. On the other hand, mentoring, which required self-reflection on the part of those being mentored, especially new recruits, was a means through which individuals, through their own endurance and actions, were being transformed into corporate clones. Further, Fischer (1996) also identified how audit firm administrators introduced expert systems to facilitate control over practitioners. In the same context, Fischer and Dirsmith (1995) noted that organisational control in audit firms involves introducing technologies that could govern the audit process. In this way, the expertise of auditors is broken down into manageable parts and encoded into the technology so that they use the technology, their work could be auditable (Power, 2003). Such is the case because administrators are concerned with regulators’ doubts about audit quality, potential litigation and over-auditing.

The structure and judgement debate (Power, 2003; Curtis and Turley, 2007) demonstrates the ongoing challenges of imposing organisational bureaucracy on professional auditors who strive for autonomy in the way they would like to conduct the audit process. Others (Covaleski et al., 1998; Empson, 2004) have expressed the idea that auditors within firms are always
faced with the dilemma of reconciling their organisational identity (relating to their position as employees of audit firms) and professional identity (which is commitment to the values of the auditing profession). It is this aspect of questioning themselves that this section attempts to discuss and link to the embedding of BDA into the audit process.

**Identity**

Hogg and Abrams (1988, p. 2) define identity as “people’s concepts of who they are, of what sort of people they are, and how they relate to others”. Similarly, Taylor and Scapens (2016), in the context of organisational identity, indicate that identity pertains to the characteristics which members associate with the group. It is documented that audit firms are sites where identity for auditors is constructed (Cooper and Robson, 1996; Empson, 2004; Robson et al., 2007). These studies have demonstrated how these firms use “ideological talk” to implement formal systems and normative controls to manage audit practitioners. Kraus et al. (2017, p. 43) refers to “ideological talk” as a means of ideological control which relies on communication skills of leaders of an organisation to convey the organisation’s ideology. They argue that ideological talk “allows managers to help their employees to envisage how their work fits into the idealised vision of the organization”. In other words, audit firm administrators are involved in the construction of auditors’ identity and that process occurs at different hierarchical levels within audit firms. This means that, as practitioners are involved in the shaping of identity through ideological controls, administrators are also subjected to the same conditioning through socialisation (Covaleski et al., 1998; Anderson-Gough et al., 2000).

In other practice domains, Burri (2008) demonstrated how the introduction of imaging technology (magnetic resonance imaging) at MRI centres across Europe and the USA transformed the professional identity of radiologists. The study revealed that the implementation of MRI scanning prompted radiologists to question their identity and, in the process, to develop an ideological talk that enabled them to reconstruct their expertise and protect their autonomy in interpreting MRI results from other professions who had access to similar technology. Extending this observation, it could be argued that understanding auditors’ identity in a data driven environment is important because it links BDA to how
“[auditors] perceive their [identity] and how they believe important others perceive it (construed external image)” (Abrahamsson et al., 2011, p. 346). The linkage “constitutes a highly influential perceptual lens informing [whether] issues and events [relating to BDA] are deemed critical and which are not” (Ibid, p. 346). Such is the case, since identity is critical in transforming the way individuals see themselves and others, including their behaviour and thought processes, in a particular context (Cowen and Hodgson, 2015). In the context of auditing, identity has been regarded as serving various roles, such as providing comfort and guidance in an uncertain environment, objectifying the external image of auditing and acting as a source of informal control (Pentland, 1993; Empson, 2004 and Khalifa et al., 2007).

As noted by Burri (2008), the success of implementing technologies in a particular organisation depends on the ability to create congruency between auditors’ identity and how they perceive that the outside world defines them (Giddens, 1991; Taylor and Scapens, 2016). Several studies (Covaleski et al., 1998; Anderson-Gough et al., 2000; Empson, 2004) have documented the role of audit firm administrators in facilitating such congruency through discourses that de- or re-identify auditors. These studies have provided narratives of identity construction which could be classified under the banner of identity regulation (Alvesson and Willmott, 2002) to show how identity can be used as organisational control. Cowen and Hodgson (2015) suggest that investigating the way identity is regulated provides an interesting opportunity in understanding “the processes by which individuals, groups and organizations deal with change, ambiguity and complexity” (p. 1524).

3.2.2 Identity regulation as a means of organisational control (over audit work)

Identity regulation as a theoretical construct has roots within Foucauldian studies which, among other things, analyses the relationship between power and society through the lens of discursive strategies. As such, identity regulation is a means of disciplining employees, involving a wide range of exogenous and endogenous forces which those with authority and power present in the form of discursive practices. Identity regulation may sometimes give an impression that it is about management’s enforcement of employee behaviour (Nair, 2010). This could be the case, but this study takes the approach that identity regulation can be fluid. This means identity regulation can involve a combination of enforcement and implicit means.
which allow auditors to internalise their behaviour, or it can be part of the developmental process which employees (auditors) go through (Empson, 2004). Therefore, identity regulation relates to “discursive practices concerned with identity definition that condition processes of identity formation and transformation” (Alvesson and Willmott, 2002, p. 627). Subsequent studies have extended this definition to also include managerial efforts aimed at influencing how employees cope with challenges (Gotsi et al., 2010, p. 782).

These discursive strategies produce framings which are designed to influence identity transformation “accomplished through the self-positioning of employees within managerially inspired discourses about work and organization with which they become more or less identified and committed” (ibid. p. 620). By means of identity regulation, those in positions of authority employ ideological talk (Kraus et al., 2016) that has the potential to nurture and develop employees into corporate clones by internalising corporate goals and values (Covaleski et al., 1998). Doing so creates an appropriate employee for the organisation because of the way discursive practices within the ideological talk are framed to resonate with employees’ aspirations, hopes and fears. This is referred to as the management of employees’ “insides” (Knights and Willmott, 1989). Identity regulation as a form of organisational control takes the normative approach because it is designed to win the hearts and minds of employees (Kunda, 1992; Covaleski et al., 1998) in the hope of achieving their commitment to the fulfillment of organisational goals.

Through identity regulation in the context of auditing, firms have used discursive strategies to change and manage the conceptualisation of professional identity by connecting auditors’ hopes and fears to the ideals of audit profession programmes. The purpose of identity regulation is to trigger identity work. Identity work refers to individuals “being engaged in forming, repairing, maintaining, strengthening or revising the constructions that are productive of a sense of coherence and distinctiveness” (Sveningsson and Alvesson, 2003, p. 1165). Hence, there is a recursive relationship between identity regulation and identity work because those implementing identity regulation strategies (in this context, administrators at audit firms) are also employees with self-interest (Empson, 2004). It is the interaction of identity work and identity regulation that creates employees’ self-identity, which is the outcome of the identity construction process (see Figure 3.4). Despite the framework having
three constructs, this study focuses on one aspect of the framework, namely the construct of identity regulation, in order to explore the practices within audit firms through which attempts are made to embed BDA in the delivery of an audit.

**Figure 3.4 Adapted identity regulation framework (Alvesson and Wilmott, 2002, p. 627)**

Identity regulation prompts identity work through the framing of discursive strategies. The process requires managers to appeal to the central values of the organisation or profession and to the distinctiveness of its employees or members, and to demonstrate that whatever is being promoted would enhance the endurance of the organisation or profession (Empson, 2004). Doing so requires audit firms to identify areas where the discourse of promoting, in this case BDA, would show how this is central to audit firms, how it would enhance the distinctiveness and endurance respectively of auditors and the audit profession. Alvesson and Willmott (2002) identified four areas targeted by such discourses, namely employees (auditors at all levels of the hierarchy), actions (the audit process), social relations (the audit firm) and the scene (audit engagement).
In this study, all four areas are combined when exploring the targets of identity regulation. The assumption is that when administrators of audit firms target auditors they are also targeting the audit process, social relations and the scene. The target should not be viewed as something independent of an auditor and something that needs to be attained but as a process within which auditors’ identity is constructed. It is not the end itself, but a means to achieve that end, which is auditors’ identity. Alvesson and Willmott (2002) also identified nine overlapping practices which could be employed in relation to the four targets (see Figure 3.4) and which are discussed in more detail in the following sub-section. However, in this context, the nine practices are used to explain the implicit and explicit means which administrators use to target auditors in their quest to embed BDA within the audit function.

Targeting auditors

Contemporary audit literature provides some examples of audit firms making use of discursive strategies to manage the conceptualisation of professional identity by practicing auditors. Anderson-Gough et al.’s (2002) study of audit trainees, documents how they were led to adopt more client-oriented professional identities by their firms in response to growing competitive pressures. They note, in this regard, that client service was a “central value transmitted by socialisation, to the extent that one trainee felt that such service should be provided, even where it involved dishonest or morally dubious actions” (p. 52). Empson (2004) conducted a study of a merger of two firms to demonstrate how, despite substantial resistance from some practitioners, administrators employed discursive mechanisms to unify the organisational and individual auditors’ identities in the two firms around the notions of commercialism and client service. The work demonstrates the role of administrators in shaping competing identities. Both these studies demonstrate the dynamics whereby audit firm managers appeal to the practitioners’ key values and belief systems to convince them that what is being promoted will enhance the survival and development of the organisation.

It has been suggested that raising aspirations and redefining responsibilities of an individual can potentially lead them to question or to define his or her central life interests, thereby triggering identity work (Alvesson and Willmott, 2002). When targeting audit firm employees, instruments of socialisation, such as training programmes and recruitment exercises, are used...
to promote the identity regulating discourse so that targeted auditors can question “who they are” and “what they are”. In the context of change, practices such as training programmes, can involve problematising the current role defining the person (Goretzki et al., 2013). Such problematisation, in turn, may cause doubt about identity coherence (endurance) and distinctiveness (Empson, 2004).

In this regard, audit studies have demonstrated how administrators target auditors at all levels in the audit function hierarchy. Covaleski et al. (1998) showed, for example, how audit firm partners were the targets of the management in objectives initiatives implemented with the aim to promote profit-driven professional mindsets. In the same study, trainees were the target through a mentoring scheme. Similarly, Anderson-Gough et al. (2000) show how early auditors were targeted (i.e. regulated – Alvesson and Willmott (2002)) to be more client-centric. In sum, these and other studies effectively reveal one important target of identity regulation – practitioners themselves – by showing how their identities can be molded to fit the new organisational demands and realities by attending to their personal interests, career aspirations and drive for status.

**Targeting the audit process (action orientations)**

In addition to targeting individuals’ personal beliefs and motivations, administrators often pursue organisational objectives by targeting what employees do in order to fulfill assigned roles. This may involve revisiting the choice and nature of methods and techniques involved in delivery but also more implicit forms of influence on action orientations, such as providing employees with an elaborate vocabulary of motives (in other words, ideological talk “that provides the fundamental justification and legitimation for what it would have employees believe is an established order” (Kraus et al., 2016, p. 1)) or appealing to specific morals and values corresponding to the new objectives (Alvesson and Willmott, 2002).

In the audit literature, a discourse of audit quality and economic efficiency exemplifies the kind of vocabulary of motives that has been a key rhetorical instrument with which to justify changes in audit technology (Curtis and Turley, 2007; Khalifa et al., 2007). Yet, we have also seen how increasingly commercialistic values have provided a key rationale for action orientation in many, specifically the largest, audit firms (Guo, 2016). Considering the apparent
tensions between the rising commercial logics and traditional professionalism (Humphrey and Moizer, 1990; Empson, 2004; Andon et al. 2015), targeting auditors’ action orientations presents a challenge, as the motives (e.g. revenue generation) often come into conflict with the morals (ethical traits such as auditor independence).

Audit firm (social relations)

Identity regulation practices may also target social relations with the focus on making employees feel that they are part of a group with shared knowledge and understandings of practice. Through group categorisation and affiliation, employees’ distinctiveness and central life interests are accommodated and enhanced. Pentland (1993) demonstrated how audit teams provide a sense of confidence to individual auditors. Group affiliations also define the boundaries of what individuals can do by creating “shared understanding of distinctive features that characterize some social group – in other words surrounding discourse which elaborates hierarchical positions and boundaries between those who are seen as being part of the group and those who are not” (Gendron and Spira, 2010, p. 277) (see also Empson (2004) for her concept of “inter-subjectivity”).

Audit engagement (the scene)

The regulation of identity through targeting mechanisms that enact boundaries is relevant to this study. The audit engagement places boundaries at the heart of the audit process because auditing rules (auditing standards and firm guidelines) determine what the auditor can do. Further, with the potential ligation risk associated with audit failure, understanding the parameters (the context) of the engagement is important. There is an active research interest in auditing which focuses on the audit profession annexing other spaces (see Andon et al. (2015) for a review) and which uncovers how such an exercise proves to be problematic. For example, Gendron and Barrett (2004) demonstrated how audit firms failed to establish their presence in cyber space. The study revealed the significance of socialisation and face to face interaction between the auditor and the client. In this regard, embedding BDA within the audit function could have the same effects as those observed in Gendron and Barrett’s (2004) study because, with the use of BDA, human interaction is affected, especially during audit
evidence collection and processing. However, social relations would also be important in establishing how expertise in BDA is constructed within the audit function. Studies have shown that a network of relations is influential in the process of expertise construction (Gendron et al., 2007; Power, 1997).

It could be argued that social relations and the scene are macro targets of identity regulation, with the focus largely on the way auditors interact with others outside the audit function, e.g. individuals in the risk advisory function, regulators and even clients. This interaction occurs in the context of the rationalities of auditing. Macro targets of identity regulation could therefore be viewed as having an influence on the legitimisation process. It is argued that management is not totalising in its regulation of the identity of employees such as auditors. In fact, subjects of identity regulation can respond in an unpredictable manner, which could inform other forms of identity regulation. Both identity regulation and identity work continuously shape the self-identity of the individual, thereby presenting identity construction in this framework as fluid and problematic.

Identity regulation in this context is a multi-level process since the focus is on all targets of identity regulation and on the exploration of the implicit and explicit means being used to encourage the use of BDA. In this regard, the emphasis is on the framing of hopes and fears as the audit environment is being populated with Big Data. Further, ways in which BDA is attached to the central values of audit firms and the profession are also explored. As the discourse of BDA in the auditing of financial statements is still developing, an inclusive approach in understanding interactions is adopted because prior studies have been in silos, for example partners (Covaleski et al., 1998), middle managers (Kornberger et al., 2011) and trainees (Anderson-Gough et al., 2000; Anderson-Gough et al., 2001; Gill, 2011). This study, however, goes further in analysing these targets together in more than one audit firm (which was the case in Empson (2004)) and also provides evidence on the nature of the interactions that take place. Given that expertise in using BDA among auditors is still underdeveloped, firms could rely on expertise from other functions within the firm. Prior studies (Fischer, 1996; Curtis and Turley, 2007) have provided evidence of the tensions that exist between administrators and practitioners due to incompatibility of organisational and professional identities. These tensions are explored and the means through which they are being
addressed are sought. Understanding of how resistance (Kosmala and Herrbach, 2006) causes tensions is being sought (Gotsi et al., 2010), particularly considering that in prior research there has been little exploration of the conceptualisation of identity regulation in addressing tensions. Here, the analysis focuses on developments at the firm level as well as at other levels in the field, such as standard setting, to investigate how tensions in the use of BDA are being addressed, and also how the use of BDA is being objectified within auditing standards, thereby having implications for identity regulation.

Discursive practices are not mutually exclusive; for instance, Suddaby and Greenwood (2005) provided an account of how auditors use discursive practices to defend their central life interests and social values as defenders of public interest. Such was the case when the direction of audit firms was changing to include the provision of other services such as legal consultancy. This direction was regarded as moving towards a commercial orientation which, at the time, was not in line with the coherent and distinct nature of audit professionals as custodians of public trust (Lee, 1993).

3.2.3 Summary

The preceding discussion offers an alternative to understanding change in audit methodology by conceptualising it as the means of triggering identity work. It provides a frame through which identity work is triggered to facilitate the implementation of audit technology in the audit process. Drawing on Alvesson and Willmott’s (2002) identity regulation, a framework for understanding the embeddedness of BDA in the audit process has been discussed. It is regarded as a form of organisational control which can be used by managers to nurture and develop employees into corporate clones by appealing to their hopes, aspirations and fears through discursive practices. The prior sections acknowledge that the identity of auditors is not given a priori but rather is constructed in a given time and space (Anderson-Gough, 2001). Therefore, the study approaches the construction of identity as a process of becoming, through the ideological talk built around the interaction between auditors and technology which, in this case, is BDA. Therefore, identity regulation targets the auditor with implicit and explicit means being used to prompt identity work. The process is not unproblematic because of the documented resistance from practitioners. However, what is not clear is how the
process of identity regulation is influenced by the way BDA as a tool is configured. This can also affect the way in which BDA is used in audits of financial statements. It could also be significant in establishing whether there is real change or other evidence of loose coupling between the programmatic and technological levels of auditing. Therefore, it is important to understand how the particular properties of BDA impact on the way auditors interact with it to determine the change which firms are suggesting. This is the focus of the next section, which is meant to provide the framework for research question 3.

3.3 Theoretical construct for understanding the influence of BDA properties on the audit process

It can be noted that Sections 3.1 and 3.2 have drawn on constructs that place greater emphasis on auditors rather than on the technologies they use when discussing the nature and means of methodological change in auditing. In other words, the account of the developments relating to BDA in auditing has so far focused on the agency of audit firm administrators in promoting and embedding the methodological changes (Fischer, 1996). No account has paid detailed attention to the ways in which the properties of BDA as a technology may condition the efforts of firms to promote its relevance and to influence the particular ways in which it is made use of by practitioners in their daily audit practice. In this regard, the study builds on and extends prior studies of changes in audit methodologies, such as Robson et al. (2007), who argued that when new audit technologies are introduced in the audit field they reconstruct the market for audit services. This observation therefore acknowledges the constitutive roles of audit technologies which may be possible when auditors encounter certain characteristics or properties (whether actual or perceived) endowed in the technology (Williams, 2013). Studies in other fields show the importance of exploring the properties of technologies on their use. Properties such as algorithms (Orlikowski and Scott, 2015) and visualisation tools (Williams, 2013) in ERPs (Wagner et al., 2011) and balanced scorecards (Busco and Quattrone, 2015) have been understood as constituting or transforming domains and practices in accounting. This could mean that, when auditors use (new) audit technology such as BDA, the way in which audits are conducted could be transformed (Barrett et al., 2005; Curtis and Turley, 2007).
However, in auditing research there is insufficient attention given to the properties inherent in audit technologies that are used in everyday practice. Further, there is also a lack of research on new technologies that are introduced to change the way auditors perform their audits. Attending to such technologies could be useful in establishing the nature of the transformation and its implications. BDA is a very interesting technology in this case because its properties are vast and relate not just to collecting and processing audit evidence but to a plethora of other capabilities potentially relevant for other functions within firms, as observed in the FRC thematic report on BDA.

“Some of the data analytic tools and techniques were originally developed by firms for the advisory market. These can be difficult to apply for use in audits and therefore require careful adaptation and positioning.” (FRC, 2017, p. 18)

This quote could mean that the properties of BDA could have wider implications beyond the audit function within firms. In contrast, prior research has emphasised the auditor’s rationale or reaction to changes in the features of audit technology (Dowling et al., 2008; Dowling and Leech, 2014) and how auditors interpret these changes in terms of the symbolic roles and benefits realised (Fischer, 1996; Manson et al., 2001; Robson et al., 2007). For instance, Fischer (1996, p. 221) stated that “to produce audit efficiencies [from the use of expert systems], the developed technologies must also be created, or ‘realized’ by practicing auditors as a ‘weighty’ source of audit evidence”. This quote points to the rationalisation which auditors make regarding the technology in order to adopt it. On the reaction to change in audit technology, Barrett et al. (2005, p. 8) uncover the idea that the appropriation of BRA to local offices “demonstrates how concerns about social integration simultaneously contribute and undermine the firm’s mechanisms of system integration.” These two studies provide claims for some of the properties of audit technologies, but such properties are not put to closer scrutiny to establish the extent to which they have influenced or constrained the way auditors perform the audit or the way audit practice has been shaped.

Against this backdrop, this study considers the particular ways in which the properties of audit technologies, such as BDA, influence the way auditors perform their audits, as well as considering the implications of the relationship between auditors and BDA for audit firms. In doing so, the study brings to the fore the dynamics and consequences of methodological
changes in auditing. Therefore, to capture the properties of BDA and their influences on auditors and firms, the study turns to the sociomateriality literature (Orlikowski, 2007; Leonardi, 2011). This is relevant because it views humans and the technologies they use as entangled. It also focuses on their arrangements in the process of organising and ordering (Fayard and Weeks, 2007) social practices such as the audit process, thus allowing the ways in which auditors (social) and the use of BDA (material) may re-configure (Fayard and Weeks, 2014) the audit process to be established. From this literature, therefore, the study adopts the theoretical construct of affordance (Hutchby, 2001; Leonardi, 2011) to capture the properties of BDA and its influence on auditors and the audit practice. Specifically, the construct of affordance is used to answer research question 3, namely:

*How do particular properties of BDA impact on the conduct of the audit in a multi-disciplinary firm?*

The objective is to establish the ways in which properties of BDA afford technical functionalities that direct auditors’ attention towards particular practical uses of the technology and to determine a range of possible avenues for its broader application within the multi-disciplinary audit firm context. The study gives consideration to these properties in understanding how they facilitate or constrain the auditor’s work. Thus, the pursuit of methodological change is, to a greater extent, determined by the very properties of the technology being adopted. Such an exploration of the practical adaptations of BDA within audit firms provides an opportunity to better understand the reconstruction of auditing in data driven environments.

The following sub-sections discuss the theoretical construct of affordance from the sociomateriality literature and how it will be mobilised in this study to address research question 3. The sub-sections are structured as follows: Sub-section 3.3.1 discusses the construct of affordance as articulated in the sociomateriality literature. Sub-section 3.3.2 extends this discussion by demonstrating how the construct of affordance and two related concepts of configuration and relationality may be useful analytical tools to explore the embedding of BDA in the auditing of financial statements. Finally, Sub-section 3.3.3 provides a summary.
3.3.1 The sociomateriality perspective and auditing research

The sociomateriality perspective has been articulated in a growing body of studies seeking to explore practices in organisations by emphasising how “the social and the material are considered to be inextricably related — there is no social that is not also material, and no material that is not also social” (Orlikowski, 2007, p. 1437). Thus, studies which use sociomateriality refute the delineation of technology as either deterministic or socially constructed and recognise the importance of both the material and the social in the construction of technology. Further, they also denounce the separation of the social and the material, recognising that material and social are pervasive in an organisation’s practices and the ordering of these practices (Orlikowski, 2007). In doing so, sociomaterial studies do not privilege humans over material objects or vice versa and are regarded as post-humanist since “the human” is decentred (Monteiro and Nicoline, 2015). According to Leonardi (2010), a technology can be regarded as a material object if it satisfies one or all of the following attributes: (1) it has physicality in that it can be perceived, e.g. working papers; (2) it represents a practical instantiation of an abstract concept or idea, e.g. the ARM, BRA, statistical sampling and auditing standards; and finally (3) it is significant in a particular context, e.g. audit reports. Therefore, if a material object satisfies one of these three attributes, it is regarded as having materiality (Leonardi, 2010). Sociomateriality researchers acknowledge that organisational practices are manifested in the entanglement of humans and the material objects they use or encounter.

The sociomateriality perspective is prominent in information technology (IT) and organisation studies (Jones, 2014) but in auditing research using this perspective is underdeveloped and studies that separate the social from material objects are still prevalent. Most studies, especially those on technological change, have taken either a deterministic or a social constructionist (Pinch and Bijker, 1984) approach to understanding the new technologies and their influences. For instance, in technological determinism, studies attempt to understand how technology leverages the audit process (Eilifsen et al., 2001). The studies in this strand are techno-centric because technology is viewed as structuring organisational activities including the audit’s decision-making process (Dowling et al., 2008; Kotb and Roberts, 2011). Humans are regarded mainly as recipients of the technology which has been exogenously
appropriated (Bedard and Graham, 2002; Leonardi, 2011; Dowling and Leech, 2014). On the other hand, researchers studying audit technology as a social construction, view it as the product of on-going negotiation between various groups of individuals who are relevant to the technology. These studies are human-centric because they give primacy in terms of the construction of audit technology to auditors and other relevant actors in the field (Fischer, 1996; Robson et al., 2007). Audit technology is perceived as a negotiated endeavour because of variations in the way stakeholders, such as audit firm administrators and practitioners, perceive, interpret and use it (Fischer, 1996; Curtis and Turley, 2007).

There has so far been no research that has applied the sociomateriality perspective to the study of audit practice. However, sociomateriality could be used to understand how and why specific practices in the audit process, such as audit tests, analytical procedures, re-performance, circularisation and others, carry material attributes (in the sense of being imprinted in objects, such as audit manuals, practice standards and working papers, among others) and effectively represent sociomaterial assemblages in which such attributes and human agency interact and mutually shape each other (Humphrey and Moizer, 1990; Cooper and Turley, 1991; Power, 1997; Barret et al., 2005; Curtis and Turley, 2007). On that basis, this study argues that the theoretical lens of sociomateriality can help better understand the use of BDA, or in other words, how the social (auditors) and the material (BDA) are related and are reconfiguring the audit process.

The construct of affordance
In sociomateriality, several constructs are used to capture the assemblages of social and material objects (for a review see Jones (2014)). In this study, the construct of affordance is adopted to offer insights into understanding the role of technologies in transforming organisational practices (Bérand, 2014; Fayard and Weeks, 2014; Hultin and Mahring, 2014) and institutional spaces (Pollock and D’Adderio, 2012) when entangled with human agency. The construct of affordance “can provide a powerful lens for studying the co-constitutive relations between technology and people in organizations and... can provide a better language for describing how particular practices are shaped and patterned by structure and setting” (Fayard and Weeks, 2014, p. 237). The construct of affordance was imported into organisation and IT studies from the field of ecological psychology. The term was developed
by Gibson (1977) to understand how humans and animals make sense of the environment (Bérard, 2014). Gibson (1977) argued that the ability of humans to use a material object is determined by the object itself and its perceived and actual properties (Hutchby, 2001). Researchers in organisation and IT studies saw an opportunity in Gibson’s (1977) conceptualisation of affordance because it enabled an understanding of the possibilities that information technologies can help individuals to achieve in a given environment. Affordance, in particular, allowed researchers to conceptualise individuals and technologies as relational in a particular context. In this way, they were able to overcome the challenges associated with ontological stances (subject-object) since affordance downplays the distinction between human and object (Hutchby, 2001). Due to its attractiveness, affordance has a plethora of definitions (see Lindberg and Lyytinen (2013) for a summary). As a result, this study does not subscribe to a particular definition but rather embraces some of the views on affordance conceptualised by Hutchby (2001), Leonardi (2011) and Bérard (2014). According to Hutchby (2001), a technology can offer humans several possibilities for action. However, the use of the technology would depend on humans’ perceptions of what the technology can allow them to do. The possibilities for action in this context are the affordances of the technology. Further, the affordances are based on the materiality of the technology as discussed above. However, the technology not only ‘affords’; it also constrains humans from performing particular actions (Bérard, 2014). This means that the construct of affordance should be viewed in terms of what the technology can do and cannot do. Hutchby (2001) identified four ways of conceptualising affordances which could be relevant to BDA in this context.

First, affordances of technology are functional because they are enabling as well as constraining (Bérard, 2014). A technology can give rise to many affordances, thus offering the possibility for action. For example, a chair can afford standing or sitting on it, as well as being used as a shield in the event of danger or attack. In auditing, technology can afford the auditor to perform certain tasks and procedures, thereby deriving professional judgement from it. For example, technologies such as the ARM, ACL® and even working papers can enable auditors to collect and process audit evidence. Equally, the technology can also constrain the possibility of collecting sufficient audit evidence. Matthews (2006a) stated that statistical audit sampling could not offer auditors an opportunity to determine samples that were not representative. Exploring the functionality of affordances propels the understanding of why
certain technologies are discontinued or not adopted in organisational practice despite being rigorously promoted (Fischer, 1996) and also which properties enable and constrain the possibility for action.

Second, affordances of technology are relational in the sense that they depend on the context and the user of the technology. This conceptualisation attempts to attach the interpretive frame of the user in the way affordances are determined. A technology can be used differently by different users. For example, a chair can be used to enhance the height of someone when he or she wants to put a book on top of a shelf. On the other hand, the same chair can be used to help a child learn how to stand. However, when a chair is put in the middle of the road, it acts as a constraint for those driving on the road, as well as having no value for someone who wants to sit on it. In auditing, the use of the ARM or statistical sampling could be useful for auditors who are planning an audit but may be of less relevance when drafting an audit report. Further, given that audit firms are multi-disciplinary, such tools might not be relevant in other functions within the firm. This is important in the case of BDA because it could be used in different fields and in various functions within audit firms.

Third, affordances can also be designed into the technology rather than being limited to the inherent materiality of the technology (Norman, 1999). Here, affordance is something that users should be able to discern when using technology, which means designers of technology should work on making sure that affordances can easily be perceived. Norman (1999) called this perceived affordance. For example, designers of a chair should make sure that affordances of the chair are easily readable by the users so that the practical instantiation of the chair should be achieved. In auditing, this relates to administrators when designing audit technology which auditors have to use. Since administrators would have it in mind that the technology is meant to address audit quality and may be efficient in the collection of audit evidence, they then have to make sure that the technology is designed in such a way that auditors are able to use the technology for such purposes.

Audit firms have audit manuals (Humphrey and Moizer, 1990) and auditing standards which offer guidance on the affordance that certain technologies could achieve. Fischer (1996)
indicated how an expert system was perceived to eliminate some audit procedures in the quest for auditors to improve efficiency.

Finally, affordances of a technology lie within the cultural frame of a particular social space. This means that technologies “and their values can also be tied in with complex sets of concepts and conventional rules governing their use” (Hutchby, 2001: p. 448). Therefore, affordances can be learned. All of this argumentation points to BDA being within the programmatic and technological sphere of auditing (Power, 1997), so its use could possibly be governed by the rules and concepts of auditing. Power (2003) states that material objects in auditing (audit technologies) have a symbolic as well as a technical role in the legitimisation of auditing. Given that audit firms are now providing statutory audits and other assurance services, the expertise of auditors is required in both domains and technologies are used to instantiate such expertise (see Barrett et al. (2005) on BRA).

In accounting literature, only two studies have mobilised the concept of affordance (Pollock and D’Adderio, 2012) and the sociomateriality perspective (Wagner et al., 2011). While Pollock and D’Adderio (2012) provide an understanding of how affordance could be used in an accounting context, the concepts identified by Wagner et al. (2011), namely relationality and configuration, are particularly fruitful in articulating the construct of affordance to understand the influence of technology (BDA) on the audit process. Wagner et al. (2011) investigated the implementation of ERP at a university and the associated practices that either emerged or were changed. The study noted that designers and users of the ERP were forced to reconfigure the technology to include legacy practices because, while the technology did meet the needs (financial accounting) of one of the stakeholders (administrators), it failed to address the needs (managing research projects) of another stakeholder (faculty). The study shows that technologies such as ERPs reconfigure the practices of accounting. However, when the practices do not meet the needs of parties interested in the ERPs, the technologies can be reconfigured to perform the practices that meet the needs of both stakeholders. This process was not linear but was an experimental one in which different groups of individuals (accountants and researchers) were involved to reach a common ground. The features of ERP played a crucial role in the perception and acceptance of the technology across different functions of the university. Further, the
assemblage of humans and technology (sociomaterial) influenced the relations between functions and individuals within the university and, in so doing, allowed new practices to emerge. However, such a process uncovered power relations that existed within the organisation.

Inspired by the work of Wagner et al. (2011) and others, the concepts of reconfiguration and relationality are used in this study to understand the influences of properties of BDA in affording auditors to perform audits of financial statements (see Figure 3.5)

**Figure 3.5 Mobilising concepts of reconfiguration and relationality in understanding BDA’s affordances**

As shown in Figure 3.5, auditors in a data driven environment are required to achieve the programmatic ideals of auditing, namely provision of quality audits as per regulatory imperatives, and to also offer value to the clients. In this regard, auditors’ intentions are to meet both the professional and commercial logics of auditing (circle 1). Therefore, BDA could be used as a way of operationalising both logics through the collection and processing of audit evidence. BDA has properties that might enable auditors to collect large amounts of data from various sources and might give greater processing power. However, the properties might also
constrain the auditors to perform certain functions (circle 2). The assemblage of BDA and auditors in the provision of audits and other consultancy services could be regarded as a sociomaterial arrangement in which possibilities for action, such as wider coverage and greater data processing power, could be some of the many affordances of BDA. These affordances or constraints may rely on the auditors’ perceptions which are driven by their intentions as well as the values and regulatory frame (auditing standards and audit firms’ logics). Given the assemblages of auditors and BDA, the affordances can reconfigure both the audit process and relations within the audit firm.

Reconfiguration (box 3)

Reconfiguration entails new sociomaterial arrangements that emerge as a result of assemblages between human agency (auditors) and technology (BDA). In the context of this study, reconfiguration points to the ways in which the transformative nature of BDA is grounded in the manifestation of affordances during the use of technology. These affordances are the procedures that auditors are able to, or perceive themselves as being able to, perform as a result of using BDA. This reconfiguration is captured by exploring practices which emerge during the audit process and the properties which are significant in that process. The use of BDA could entail collecting and processing more information which could be used as audit evidence. The concept of reconfiguration in this case attempts to look at perceived or actual changes which the assemblage of auditors and BDA is bringing to the audit process. This could include understanding how the processing power of BDA differs from other technologies. In this case, how BDA is implicated in the reshaping of audit practice and audit markets (Curtis and Robson, 2007; Robson et al., 2007) is very important. Drawing on Wagner et al. (2011), BDA should include functionalities or properties which auditors are familiar with (legacy functionalities) and other properties which are regarded as new. Therefore, the concept of reconfiguration allows the establishment of what auditors might perceive as affordance and constraints in the use of BDA. It also allows the establishment of changes (or not) in the affordances of BDA, which might include change in audit procedures (routines) given that BDA analyses the whole population in a given transaction. This could also help in understanding the possibility of visualisation affordances, which might help auditors
to understand and present audit evidence in a different way and might also even offer insights as new forms of auditor knowledge. However, there could be constraints for auditors to perform certain procedures, given that BDA is in the early stages of implementation.

**Relationality (box 4)**

The concept of *relationality* recognises that the introduction of BDA into the audit process inevitably brings together various groups of people, such as auditors, data analysts etc. These people will also be part of the sociomaterial assemblage. Such an assemblage would bring benefits as well as tensions, since different groups of people have diverse interests and intentions. This points to potential questions around the relationships between auditors and other professionals such as data analysts. Since BDA is regarded as a new analytical tool in the audit field, it raises the issue of auditors’ expertise and the technical implementation of BDA. Curtis and Turley (2007) observed this in the case of the operationalisation of BRA. This could affect an audit firm’s status and competitiveness when it is due for tender. It could also affect the realisation of audit quality (human agency). This inevitably would trigger a response from the firm’s administrators to address such problems, which might involve reconfiguring the technology to make data collection easier and also restructuring the organisation to accommodate individuals with expertise in data analysis to work as auditors or alongside auditors. In essence, this process is relational and non-linear, and might produce unintended outcomes (Leonardi, 2011). These unintended consequences could relate to power issues around who has influence over the use of BDA and the design of scripts. Further, the boundary of auditing as a space might be populated by professionals from other fields. This could prompt standard setters to intervene or attempt to redefine boundaries through revision of auditing standards. In sum, BDA might create relations with other professional communities that may, in turn, influence how BDA should be used.

It is recognised in this study that the concepts of reconfiguration and relationality demonstrate the effects of the affordances of BDA. The concepts are not separate but overlap in practice. This means that aspects of relationality can create reconfiguration or reconfigurations afforded by BDA can give rise to relations within audit firms (relationality).
This is why in Figure 3.5 the connection between boxes 3 and 4 is broken, illustrating the co-production of reconfiguration and relationality.

### 3.3.2 Summary

Overall, Section 3.3 has established and discussed a framework which is used to understand the empirical evidence in Chapter 7. In an attempt to provide a multifaceted understanding the use of BDA in audits of financial statements, the preceding sections have addressed the shortcomings of focusing too much on audit firms’ discursive strategies in the promotion and implementation of audit technology. The construct of affordance (Hutchby, 2001), drawn from the theoretical lens of sociomateriality, acknowledges the roles of human agency and technology in shaping the audit process in a data driven environment. Using the affordance construct as a means of zooming in on the empirical data (Chapter 7), the implications of BDA can be explored to provide a richer perspective in understanding the influences of BDA properties in methodological change in auditing. Therefore, the affordance construct is used to expose the reconfiguration in the audit process and the emerging relationality when auditors appropriate BDA for the conduct of audits.
CHAPTER 4. RESEARCH METHODS AND METHODOLOGY

This study attempts to understand the promotion, embedding and implications of BDA in the audits of financial statements. In this regard, the previous chapters have situated BDA in the extant academic auditing literature which discusses previous developments and innovation in audit methodologies and technologies within audit firms. They have also provided theoretical constructs, namely discursive strategies, legitimacy and identity regulation drawn from NIT and the construct of affordance from sociomateriality, to act as lenses for conceptualising and analysing empirical evidence. This chapter provides a discussion on the methodological approach used to collect and analyse evidence on BDA in the auditing of financial statements. The study relies on semi-structured interviews, observations and textual data to gather relevant evidence. The primary evidence collected from interviews with relevant individuals has been complemented with observations on the operation of audit firms’ proprietary BDA tools and also with textual data on BDA which the audit firms and others in the audit profession have made publicly available.

This chapter, therefore, provides a discussion on the research strategy that has been used in the study, including the philosophical assumptions to justify the chosen methods and the way in which the empirical evidence has been analysed as the basis for understanding the use of BDA in audits of financial statements (see Figure 4.1).

Figure 4.1 Research methodology overview
The chapter is structured as follows: Section 4.1 identifies the philosophical assumptions for this study, by identifying an interpretive approach as the research paradigm that has been adopted. Section 4.2 builds on the interpretive research paradigm to introduce a qualitative research strategy and also details the methods used to collect the data. Section 4.3 discusses how the data collected is analysed; and Section 4.4 summarises the chapter.

4.1 Research paradigm

Research paradigms are “preferred ways of understanding reality, building knowledge and gathering information about the world” (Tracy, 2013, p. 38). They are important because they set parameters on what has to be investigated, the means of investigating and the interpretation of the results. As a result, situating this study in a particular paradigm offers an opportunity to contribute knowledge to that paradigm. It also demonstrates that the study is built on assumptions within a credible body of scholarship (Lukka and Modell, 2010). Research paradigms express the beliefs of the researcher on the nature and the operation of the world (ontology), which form a basis for the ways in which the knowledge about that world is acquired (epistemology). In auditing and accounting, researchers have identified a number of paradigms within which studies can be classified. These paradigms are the functionalist, interpretive and critical perspectives (Dirsmith et al., 1985; Hopper and Powell, 1985; Chua, 1986).

4.1.1 Functionalist paradigm

The functionalist paradigm is regarded as the mainstream approach in audit research because it represents the perspective which early studies in auditing adopted and which remains the dominant paradigm, especially in North America (Dirsmith et al., 1985; Humphrey, 2008). The ontological stance of this paradigm captures auditing and related phenomena as an objective reality which is independent of, and external to, the auditors and other relevant stakeholders, such as regulators and researchers. The role of auditing, in this view, is to bring stability and to manage conflicts in the domain in which it exists. Therefore, any developments in audit methodologies such as BDA are meant to enhance technical efficiency in the audit process. This involves change in audit practice in order to maintain stability and manage conflicts.
Studies also assume that audit firms make the decision to adopt and implement a particular methodology or technology based on rational choice. Further, auditors are regarded as passive actors in the social reality of auditing, implying that they would accept the use of BDA in audits of financial statements in an unproblematic manner and that any conflicts that may exist are deemed manageable.

In this paradigm, researchers are external to the phenomenon or the social reality being studied. Their role as passive actors is not to influence the structure of the social reality but just to observe the regularities or patterns within phenomena. The social reality of auditing exists a priori and the role of researchers is to uncover it through credible means. Therefore, to understand social reality in the paradigm, the research must adopt a positivist epistemological stance. This means drawing on techniques or methods from natural science, such as surveys and experiments, to collect and analyse data (Chua, 1986). Researchers use normative models to represent the dynamics in the audit environment (Power, 1995). Auditors, as a research sample, and their actions are regarded as social facts which can be observed and measured in order to draw some patterns and inferences. Therefore, a functionalist approach is regarded as a scientific approach to understanding auditing and relies most heavily on quantitative methods.

Humphrey (2008) notes that, apart from archival data and surveys, most researchers in auditing tend to use experiments as a means of understanding auditors and related techniques and methodologies. Studies in this context attempt to establish consistency and uniformity in the application of certain procedures and techniques, so that cues can be identified and measured. In order to identify these cues, researchers use hypothetic deductive logic, in which a priori theory is identified but is independent of the observed social facts, “variables” or “cues”. Researchers then develop academic conjectures called hypotheses which are meant to explain the pattern that might develop from the data (Ryan et al., 2002). In doing so, research attempts to use observable data collected from experiments or surveys to test the hypotheses using a priori theory (Collis and Hussey, 2014). The purpose is to identify variables which can explain and predict the phenomenon under study, such as auditors’ judgements. Power (1995) argues that the value of studying auditing in this paradigm is that identification of cues helps to overcome the sub-optimality in the
technical efficiency of the audit process because the cues uncovered in the patterns of observable data can be improved, thereby realising a stable audit reality.

This paradigm is criticised for ignoring the role of human agency in the audit process and for assuming that everyone involved in the audit process has common goals, for example, that the adoption of audit methodology is based on the rationality of improving technical efficiency (Humphrey and Moizer, 1990). In reference to experimental methods, some have argued that these oversimplify the audit process and that complexity of the audit environment goes beyond that captured in an experimental environment (Humphrey, 2008). This has prompted others to shift their attention to studying the interactions, power relations and construction of meaning which auditors attach to concepts and technologies within the audit process. This also requires a shift from the functionalist paradigm to alternative paradigms, namely interpretive and critical perspectives (Dirsmith et al., 1985; Chua, 1986; Humphrey, 2008).

4.1.2 Interpretive paradigm

This paradigm differs from the functionalist view of reality in the sense that it takes a subjectivist rather than objectivist view by stating that it is a product of human cognition. Since various individuals can see the same phenomenon differently, reality is multidimensional (Lukka, 2010). Also, an individual’s view of reality is fluid and emergent, depending on the context and interaction. Past experiences play a crucial role in shaping one’s reality because it is argued that you cannot detach intentions from historical practices when conceptualising the extant reality. In this regard, people’s actions are based on how they construct meanings when they interact with one another (Chua, 1986). Therefore, auditing is regarded as a process which is socially constructed through the interactions of relevant actors in the audit field. Auditors’ actions are a result of the meaning they attach to the audit process (Humphrey and Moizer, 1990; Power, 1997).

Further, the application of audit technology or methodology depends on an auditor’s intentions and prior experiences (Fischer, 1996). Through interaction with others (which include objects), audit technology, despite being socially constructed, is objectified. This
means that the technology has both technical and symbolic roles (Curtis and Turley, 2007). Thus, apart from enhancing technical efficiency, it can serve other roles that legitimise the audit process. This is made possible because, in this paradigm, “the act of interpretation [referring to] describing the meaning of something is seen as a necessary condition for creating understanding of that something” (Kakkuri-Knuuttila et al., 2008, p. 268). Given the complexity of reality and the interactions that take place, in this paradigm conflicts are anticipated but are not regarded as radical in transforming reality or structure because they are resolved by shared meanings. From this perspective, the process of promoting and embedding BDA is viewed as a socially mediated endeavour which involves the construction and interpretation of meanings which audit firms attach to BDA. Therefore, the use of BDA should be viewed as taking place within the historical context (previous developments in audit methodology) in which auditors’ past experiences and intentions are instantiated. Conflicts between stakeholders, e.g. audit firms and regulatory agencies (Bamber and McMeeking, 2016), are anticipated in the audit field but are managed through, for example, education, auditing standards and having committees to work on particular issues (which in this case could be the DAWG). Thus, auditing standards, audit engagement, education and DAWG act as means and platforms through which shared meanings are constructed (Robson et al., 2007; Curtis et al., 2016).

In this paradigm, researchers adopt the epistemological stance that focuses on understanding how individuals make sense of their reality by exploring individuals’ understanding and their subjective experiences (Collis and Hussey, 2014). Research pays attention to how the participants socially construct the phenomenon or reality. Such a process requires understanding of how participants give meaning to their actions. However, the actions of individuals are regarded as embedded in a particular social structure; therefore, actions of individuals and their intentions and motives are influenced by that structure (Chua, 1986). Since the reality being constructed is context bound, understanding the language that participants use and observing their interactions could help in understanding how they interpret audit practice and the tools they use. Researchers have to explore these shared meanings and the tools participants use to construct and make sense of the world (Ryan et al., 2002).
Given that this study attends to the promotion, embedding and implications of BDA, the interpretive paradigm fits well with the purpose of this research. This is the case because both promoting and embedding BDA in the auditing of financial statements require audit firms and auditors to attach meanings that connect BDA with the structure and programmes of auditing (Power, 1997). This means that audit firms have to interact with practitioners, regulators, clients and standard setters to develop a shared meaning regarding the use of BDA and its relevance. Therefore, in relation to research question 1, the meaning that audit firms attach to BDA during its promotion is regarded as co-produced by audit firms and relevant stakeholders in the field. Robson et al. (2007) showed that researchers, regulators and standard setters co-produced BRA. Similarly, the embedding of BDA in the audit process through identity regulation, which is the focus of research question 2, is also achieved through cultivating shared meanings between audit firms and auditors. Finally, research question 3 acknowledges that the use of BDA cannot be detached from how auditors attach meaning to it but also considers how its properties help auditors do their jobs. In sum, all three research questions recognise that auditing is a context-based phenomenon which has to be understood with reference to influences of other stakeholders and material objects (audit technology) in the field. Therefore, the researcher in this paradigm has to understand that auditing is inter-subjective because auditors are “embedded and embodied [in] interrelated experiences and in situ meanings which shift as [they] move through conversations over time and people (durability and meanings)” (Cunliffe, 2010, p. 12).

In the last three decades, the interpretative paradigm has attracted many researchers in auditing and has produced significant research output (Power, 2007). Further, in researching audit technologies, scholars such as Carpenter and Dirsmith (1993), Fischer (1996), Curtis and Turley (2007), Robson et al. (2007) and Curtis et al. (2016), have shown the strides which can be achieved in understanding the process, lived experiences and construction of meaning within the audit field. Therefore, studying auditing within this paradigm provides a deeper understanding of the audit field and complements studies adopting a functional perspective.
4.1.3 Critical paradigm

Under this paradigm, social reality is regarded as both objective and subjective. It is objective in the sense that social structures are regarded as existing independently as objective practices and conventions which participants experience (Chua, 1986). However, social reality is also subjective because these structures can be transformed by human action and therefore are also in the ‘state of becoming’ (fluid). In doing so, the critical paradigm acknowledges that reality is made up of what we see and what we do not see. This conceptualisation of the nature of reality means that reality has actualities and potentialities (Lukka and Modell, 2010).

In the context of auditing, the audit process can be deemed as what we actually see in terms of the processes and tools, but also in terms of what is not represented on the surface (Ryan et al., 2002). Researchers in this paradigm indicate that domination by certain classes of individuals decides what is regarded as reality, and what is not (Chua, 1986), thereby suggesting that human action is restricted by systems of domination. It follows that a critical perspective portrays the audit environment as conflict laden and self-interest driven. However, it differs from the interpretive paradigm in the sense that it focuses on this domination, and on conflicts and interests for the purpose of exposing the alienation of a marginalised class and of potentially triggering radical change (Chua, 1986). Researchers attempt to offer a voice to the marginalised class by attending to methodological approaches that investigate how particular concepts or phenomena emerge. This includes understanding the forces that shape the emergence of the concepts (Power, 2013). These studies prefer historical and archival approaches. In auditing, studies from this perspective have portrayed the audit profession and its technologies as systems and tools of domination (Kosmala-MacLullich, 2003). Here, the audit profession is seen as not operating in a vacuum but within the web of political, social and commercial relations (Power, 2013). The researcher’s role is to understand these relations as new/old concepts emerge and disappear.

Given that this study investigates subjective experiences of auditors as well as the meaning they attach to audit technology in its promotion and construction of auditors’ identity, the interpretive paradigm is preferred over the functionalist approach in understanding the use of BDA in audits of financial statements. Further, the aim of the study is not to measure the
impact of BDA in the auditing of financial statements because it recognises that subjective experiences and the use of BDA is contextual and fluid (Saunders et al., 2015).

Finally, this study does not intend to investigate radical changes in the audit field triggered by domination or alienation of firms as a result of using BDA, but rather how meanings are constructed and interpreted by participants in the audit field as they use BDA in order to maintain the social relevance of auditing, and therefore critical perspectives have not been considered appropriate in this study.

4.2 Research strategy and data collection methods

4.2.1 Research strategy: qualitative research

As noted in the previous section, the study adopts an interpretive paradigm to capture the promotion, embedding and implications of BDA in the auditing of financial statements. The adoption of this paradigm leads the study to a qualitative research strategy. Qualitative research is relevant when the researcher aims to explore and capture the depth of a phenomenon through the analysis of linguistic data (Tracy, 2013). This is important in this study because qualitative research would help the researcher to uncover the meanings that firms attach to BDA when legitimising and encouraging its use (Khalifa et al., 2007; Robson et al., 2007) and to establish the way auditors within firms make sense of the developments in BDA and its implications for audits. The study takes a holistic view in approaching an understanding of BDA so that themes emerging from the study can be discerned without a priori assumptions (Ryan et al., 2002). The purpose is to obtain deep descriptions of BDA in the audits of financial statements which cannot be gathered through a quantitative research approach.

Quantitative research requires prior theories to be identified and hypotheses to be established and tested (Collis and Hussey, 2014). This could have been useful if the empirical studies on BDA in the auditing of financial statements were well developed and the objective of the study were to establish the cause and effect of BDA based on a number of predetermined proxies or variables (Chua, 1986). However, given that the empirical study of
this use of BDA is still in its infancy and that most studies are conceptual, this study benefits from using qualitative research to explore BDA in a less structured way so that it establishes what is actually going on within the audit field. Therefore, the study follows inductive, rather than deductive, logic to understand the use of BDA in the audit environment (Lukka and Modell, 2010; Tracy, 2013). Inductive logic entails collecting evidence about interactions and discursive strategies that have been observed in relation to BDA and then, from the researcher’s point of view, to make claims about that evidence to generate findings. Inductive logic is appealing here because this exploratory study aims to understand BDA given that there are limited empirical studies on how it is being promoted and embedded and on its implications in the audit process. Using deductive logic could have been unfruitful in this study because there are limited broad or general theories on BDA to help observe its use and because any hypotheses that could be developed would be based on underdeveloped empirical audit literature. In addition, the researcher’s conceptualisation of reality is that of social construction which is at odds with an understanding of reality in which it is regarded as external and independent. Further, theoretical constructs from NIT and sociomateriality, namely discursive strategies, legitimacy, identity regulation and affordance, which are being used in this study (see Chapter 3), are not meant to be tested so that the study can confirm or disconfirm pre-existing theories, but rather are meant to help in interpreting the empirical evidence collected.

4.2.2 Research methods: data collection

This study has collected evidence through semi-structured interviews, demonstration of tools and textual data relating to BDA in auditing, which is still a nascent area in auditing research and is regarded by firms as commercially sensitive. Semi-structured interviews were preferred to structured interviews for the following reasons. First, semi-structured interviews give the researcher both flexibility and discipline in collecting the evidence in an area or technology that is still emerging (Collis and Hussey, 2014). Second, through semi-structured interviews it is possible to explore many aspects of a particular issue, such as participants’ feelings and opinions, and also to establish motives behind the development of BDA tools (Humphrey and Moizer, 1990). Third, interviews also provide an opportunity to compare and contrast BDA with prior developments. This is significant in establishing the implications of
BDA for audits of financial statements (Curtis and Turley, 2007). The use of hypothetical questioning during the interviews helps to reveal how auditors co-produce the social reality of audits with BDA (Tracy, 2013).

The study has also collected evidence through observing demonstrations of BDA tools by auditors. The observations provided the means to see how auditors use BDA tools in practice. Textual data, such as audit firms’ transparency reports, has also been used to complement the information gained from participants during the interviews, provided both the official narratives and marketing strategy for promoting developments in BDA. In the next sections, a discussion on how evidence was collected is presented, starting with the semi-structured interviews and followed by the observations, then by the textual data.

**Semi-structured interviews and demonstrations**

As a first stage of investigating development and use of BDA in audit firms, the initial objective was simply to gain a background understanding of BDA in both business and auditing. Therefore, in June 2015, the researcher conducted pilot interviews involving three consultants from three companies that provide assistance on areas relating to BDA, such as recruitment of data analysts, provision of BDA tools and manipulation of BD for clients’ use, as well as one partner (audit methodology and analytics) from one of the Big Four firms. The process of selecting the participants for the pilot interviews involved compiling a list of companies that deal with BDA in various areas of business. From this list, specific individuals were identified based on their designated roles in BDA development and implementation. An email was sent out to these individuals requesting their availability and willingness to participate in the pilot interviews. Telephone calls were also made, either as a follow up or to contact individuals whose email addresses were difficult to obtain.

Three consultants responded and agreed to participate, two of whom were involved in helping companies develop and implement BDA tools while the third was involved in recruiting data analysts for the Big Four. During the pilot interviews, the consultants were asked to provide general information on BD and BDA tools with the aim of establishing the current trends in BD and BDA. In order to have an initial perspective from the audit firms, a
partner from one of the Big Four was also interviewed to provide a general overview of how BDA is being used in financial statement audits and of the expected future direction of travel with BDA.

As a result, the pilot interviews gave a broad understanding of BDA, its general drivers and the skill set required, as well as of the challenges associated with it.

Based on the information and understanding from the pilot interviews, the next step was to develop the interview schedule strategy (see Appendix, schedule 1). This was done in conjunction with information collected from textual sources, such as the websites on which the audit firms, professional bodies, regulators and standard setters have published discussions or comments on BDA. It also happened that at this time, IAASB’s working group on BDA (DAWG) was actively engaged in meetings and publications. The minutes of these meetings were sought to devise a plan for the areas to be covered in the interview schedule.

In order to identify the potential participants for the study, the researcher drew on the experiences from the pilot interviews and adopted both opportunistic and purposive sampling: opportunistic sampling in the sense that the researcher deliberately attended conferences and forums where issues relating to BDA in audits were being discussed; and purposive sampling because only those participants who were dealing with developments in, and the implementation of, BDA in audits were targeted. This approach led to the potential participants for the main interviews being identified, first during the Accountancy Europe (formerly known as Fédération des Experts Comptables Européens (FEE)) audit conference in Brussels in June 2015. The theme for this event was “Long Term Vision and Short Term Challenges”, with two leading developers of ERPs (Oracle and SAP) and two of the Big Four (KPMG and PwC) making presentations on the implications of Big Data for financial reporting and the relevance of BDA for audits of financial statements.

Attendance at the event provided an opportunity to discuss issues relating to BDA informally with auditors and stakeholders from the UK and mainland Europe. Some of the discussions resulted in subsequent formal interviews to further explore the issues addressed in these informal meetings. A ‘snowballing’ approach was followed whereby participants who were interviewed referred the researcher to other potential participants. However, not every
referent was pursued as participants were carefully chosen on the basis of whether they met one or all of the following criteria. First, they had to have direct involvement in BDA at a regulatory, development or implementation level within an audit firm. This meant that partners, managers and individuals at the practice level working in an audit function or in other functions within firms that offer BDA assistance or advice to auditors were sought. The participants working in other functions were required to confirm that their work with BDA also involved working with auditors on their engagements. As a result, apart from participants with an audit function, participants were also drawn from the data assurance and risk advisory functions of audit firms.

Second, participants that had demonstrated engagement with other stakeholders on matters relating to BDA in audits were also considered. As a consequence, the researcher also approached members of the DAWG and senior personnel at the FRC. Further, to explore how BDA is embedded in the audit function, participants who actively use BDA in audits were identified. These participants ranged from those who had just recently joined audit firms to those that had been with firms for a considerable period of time. Therefore, engagement partners, managers, directors, IT auditors, data analysts and junior auditors were interviewed.

In sum, a network of individuals with knowledge of and experience with BDA tools in the context of auditing was developed (Tracy, 2013). Including the four participants in the pilot interviews, there were in total 24 participants identified and who accepted the invitation via email or phone to provide information on BDA through interviews. The participants had experience either in auditing or with BDA tools, ranging from three years to over twenty years. This was useful because experienced participants were able to share during the interviews information about developments in audit technologies and how they have changed over the years. Further, some participants indicated that they had either been promoted or had changed jobs, e.g. from one audit firm to another or from an audit function to another function within the same firm, or from an audit firm to one of the professional bodies or regulators. This was of value because a holistic view of changes in the audit field associated with BDA was not captured from one particular perspective but from the field as a whole.
In total, 27 semi-structured interviews were conducted (see Table 4.1), including one in which three regulators gave a group interview. Five participants from the Big Four were interviewed twice as a follow up to the findings from other interviewees, whereas the remaining 16 participants were each interviewed once. Also included in the list were participants from Belgium, Italy and Holland. All interviewees have had a particular active involvement with BDA in the audit field, and together they represent three types of interaction with BDA: responsibilities with respect to development of BDA methods within audit firms, implementation of BDA in audit engagements, and evaluation of the impact of BDA for standard setting and other regulatory perspectives. Some individuals were involved in more than one role: there were four interviewees from Big Four and mid-tier audit firms who also held positions as members of the IAASB Data Analytics Working Group (DAWG). Interviews ranged in length between 30 minutes and two hours, and all but four were voice-recorded. Also, a statement on confidentiality undertakings and ethical issues was read out to the participants at the start of their interviews, and participants were asked for permission to record the discussion. All interviewees agreed but four were not recorded because of logistical issues, including the location of the interviews not providing a conducive environment for recording. In those cases, comprehensive notes were taken.

During the interviews, participants were asked questions following the interview schedule (See Appendix, Schedule 1) which had an agenda designed to cover a range of topics including the following: their role and how it is related to BDA; the key developments with regards to BDA within their respective organisations and in the audit field in general; what aspects of BDA they consider most useful / relevant to them personally, to their organisations and to their clients; the current state of development with regards to BDA and any related challenges; and the impact of BDA on various aspects of the audit process and its organisation. Participants were encouraged to discuss points beyond the structure of the interview questions which could be considered as relevant to BDA in the audit of financial statements. In addition, participants were also asked if they needed a copy of the transcript for verification after the interview, but they all agreed that this was not necessary. At the end of each interview a reflective memo was recorded by the researcher.
In addition, the researcher was invited to attend five sessions in which the use of BDA tools was demonstrated in a practical setting, with a possibility for follow up questions and discussion. One session was conducted on the premises of a mid-tier audit firm, and the remaining sessions were in the offices of Big Four firms. The sessions were between 20 and 45 minutes long and focused on the practical application of BDA tools in areas such as assessment of internal controls, analysis of journal entries, risk assessment, compliance with particular auditing standards (e.g. ISA 240), and visualisation. Due to concerns over competitive sensitivity, the author was only allowed to voice record the sessions. However, notes were taken and sketches were drawn of the tools, whenever possible, during and immediately after the sessions.

Table 4.1 List of interview participants

<table>
<thead>
<tr>
<th>Code</th>
<th>Participant (experience)</th>
<th>Organisation</th>
<th>Date</th>
<th>Role(s)</th>
</tr>
</thead>
</table>
| P1   | Partner – Risk Analytics** (>20yrs) | Big Four Audit Firm | Jun 2015 and Aug 2016 | • BDA development  
• BDA implementation |
| P2   | Partner – Global Audit Methodology (>20yrs) | Big Four Audit Firm | Oct 2015 | • BDA development  
• BDA implementation |
| P3   | Partner – Global Leader, Quality and Risk (>20yrs) | Mid-tier Audit Firm | Nov 2015 | • BDA development  
• BDA implementation  
• Standard setting (DAWG) |
| P4   | Partner – Head of Assurance (>20yrs) | Mid-tier Audit Firm | Dec 2015 | • BDA development  
• BDA implementation  
• Standard setting (DAWG)  
• Regulation |
| P5   | Partner – Audit Methodology **(>20yrs) | Big Four Audit Firm | Nov 2015 and Aug 2016 | • BDA development  
• BDA implementation  
• Standard setting (DAWG) |
| P6   | Partner – Data Analytics (>20yrs) | Big Four Audit Firm – Netherlands | Sept 2015 | • BDA development  
• BDA implementation  
• Standard setting (DAWG) |
| P7   | Partner – Data Assurance (>20yrs) | Big Four Audit Firm | Apr 2016 | • BDA development  
• BDA implementation |
<table>
<thead>
<tr>
<th></th>
<th>Role</th>
<th>Firm</th>
<th>Year</th>
<th>Details</th>
</tr>
</thead>
</table>
| P8 | Partner (>20yrs) | Big Four – Italy | Jun 2015 | • BDA development  
• BDA implementation |
| D1 | Director – Audit Methodology **(>15yrs) | Big Four Audit Firm | Oct 2015 and Nov 2015 | • BDA development  
• BDA implementation |
| D2 | Director – Analytics **(>10 yrs) | Big Four Audit Firm | July 2015 and Oct 2015 | • BDA development  
• BDA implementation |
| R1 | Director – Inspection *(>20yrs) | Regulator | Jun 2016 | • Regulation |
| R2 | Head of Audit and Assurance *(>20yrs) | Regulator | Jun 2016 | • Regulation  
• Standard setting |
| R3 | Audit Quality – IT audit inspector *(>20yrs) | Regulator | Jun 2016 | • Regulation  
• Standard setting |
| R4 | Director of Audit Quality (>20yrs) | Regulator | Jun 2016 | • Regulation |
| R5 | Regulator (>20yrs) | Regulator – Belgium | Jun 2015 | • Regulation  
• Standard Setting |
| M1 | Manager – Audit (>10yrs) later on promoted to Director | Big Four Audit Firm | Nov 2015 and March 2018 | • BDA implementation |
| M2 | Manager – Audit (>10yrs) | Big Four Audit Firm | Nov 2016 | • BDA implementation |
| M3 | Manager – Data Assurance (>15yrs) | Big Four Audit Firm | Aug 2016 | • BDA development  
• BDA implementation |
| M4 | Manager – Audit (>7yrs) | Mid-tier Audit Firm | Aug 2016 | • BDA implementation |
| A1 | IT auditor (>6yrs) | Big Four Audit Firm | Sep 2016 | • BDA implementation |
| A1 | Auditor (>3yrs) | Big Four Audit Firm | Feb 2018 | • BDA implementation |
| C1 | Consultant (>10yrs) | Non-Audit Firm (Data Analytics) | April 2015 | • BDA development |
| C2 | Consultant (>6yrs) | Non-Audit Firm (Data Analytics) | April 2015 | • BDA development  
• BDA implementation |
| C3 | Consultant (>7yrs) | Non-Audit Firm (Data Analytics) | April 2015 | • Recruitment of data analysts for Big Four audit firms |

* Group interview  
** Members of IAASB’s DAWG

**Textual data**

The evidence from interviews and demonstrations of BDA tools were supplemented with textual data obtained from the websites of audit firms, professional accountancy bodies and
regulatory agencies as well as during interviews (see Table 4.2 for a summary list of documentary evidence collected). The textual data includes transparency reports from the Big Four and mid-tier audit firms. Since most firms began making public statements about BDA from 2013 (FRC, 2016), the reports were for a period covering 2013-2016. Further, evidence was also collected from the results of surveys conducted by the Big Four and professional bodies, namely ICAEW, ACCA and Accountancy Europe (Formerly FEE). Audit reports produced by the Big Four for companies listed on the stock exchange between 2014 and 2017 were also sought. Textual data in documents published by the IAASB were also collected, including minutes of DAWG meetings from its inception in 2015 to 2017, response letters from various organisations and individuals to DAWG’s discussion paper and invitation to comment on BDA in audits of financial statements in 2017. Conference proceedings of the Accountancy Europe Annual Conference in 2015 were also analysed. In 2017, FRC published a thematic Report of Data Analytics based on a study of audit firms they had inspected for audit quality. This report gave an insight into how firms were using and making claims about BDA. Also, audit inspection reports published by the FRC were collected to understand the regulator’s position on the issue and their perspective on the implementation of BDA. Finally, brochures and any publicly available documentation published on Big Four and mid-tier firm websites were collected and searched, together with documents given by participants during interviews.

Table 4.2 Documentary evidence

<table>
<thead>
<tr>
<th>Documentation</th>
<th>Data Sources (Organisations and Websites)</th>
<th>Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transparency reports</td>
<td>Big Four and mid-tier audit firms</td>
<td>2013-2016</td>
</tr>
<tr>
<td></td>
<td>• www2.deloitte.com</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <a href="http://www.ey.com">www.ey.com</a></td>
<td></td>
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<tr>
<td></td>
<td>• <a href="http://www.kpmg.com">www.kpmg.com</a></td>
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<tr>
<td></td>
<td>• <a href="http://www.pwc.co.uk">www.pwc.co.uk</a></td>
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<td></td>
<td>• <a href="http://www.bdo.co.uk">www.bdo.co.uk</a></td>
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<tr>
<td></td>
<td>• <a href="http://www.grantthornton.co.uk">www.grantthornton.co.uk</a></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <a href="#">www.rsmuk.com</a></td>
<td></td>
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</tbody>
</table>
4.3 Research methods: data analysis

The evidence collected through interviews and textual data was analysed simultaneously in order to capture the relevant linkages between what was being discussed orally and what was written in official and marketing documents made available in the public domain. Both the transcripts and documentary evidence were revisited several times to understand what was being said in relation to BDA in the auditing of financial statements. Given that the research questions covered four key areas, namely (1) promotion of BDA to relevant stakeholders, (2) encouraging the use of BDA, (3) properties of BDA which facilitate the conduct of audits and (4) BDA’s implications for audit practice, the evidence was read strategically in order to extract relevant information that would help the researcher understand these areas. Therefore, an iterative analysis was used in which the focus was to understand the existing theories and explanations extant in auditing literature (Tracy, 2013). Iterative analysis is a reflexive process which allows the researcher to adopt both approaches.
to understanding the evidence collected in the light of existing theories and explanations (Lukka, 2010). Doing so therefore allows the researcher to reflect on the evidence collected and to uncover emerging insights which could form a basis for addressing the four key areas. The first stage in iterative analysis is to organise the evidence collected in a manner that is simple and easy to understand. In this case, the interview transcripts and documentary data were populated onto the qualitative data analytical software called Nvivo.

4.3.1 Organising evidence and its rationale

Interview transcripts

In Nvivo, each interview transcript was ordered in terms of the participant’s organisation and position. The categories were audit firms, regulators, standard setters and consultants. Such categories enabled the researcher to establish the feelings for, and attitudes towards, BDA among different stakeholders and organisations. For example, transcripts from audit firms allowed the researcher to establish how different firms approach and promote BDA, and further, how different positions within a single audit firm feel about BDA, for instance how partners and managers view the use of BDA. The transcripts also uncovered the challenges auditors at different levels face as a result of using BDA. Transcripts from interviews with regulatory actors gave the researcher the opportunity to establish how audit quality and other aspects of the audit process affected, or are affected by, the regulation of auditing. The transcripts also provided evidence of regulators’ experiences of what is happening in real audits as regards to BDA. This information is important because it was then compared and contrasted with what audit firms had to say about BDA. Since some interview participants are also members of the IAASB’s DAWG, it was possible to obtain the position of IAASB as well as their audit firms’ points of view in the transcripts. Transcripts from consultants gave a general overview of BDA and this was important for establishing the general properties of BDA and how such properties might be used differently in audits, as well as for understanding the conceptualisation of BD in the general business environment.
Textual data

Textual data was organised for analysis purposes differently to the interview transcripts. It was organised chronologically in order to capture when the discourse on BDA in the audit field became widely used and also to observe any changes in meanings and interpretations of BDA during the interactions of stakeholders with each other. For example, in transparency reports and audit quality inspection reports the focus was very much on how BDA was being discussed in the context of regulatory space, as well as how it was being portrayed to the clients in terms of its use and justification for use in audits. Such justification might include BDA properties and how auditors see themselves in a data driven environment. This information was complemented with survey reports, with audit reports published by firms and professional bodies and also with thematic and inspection reports from regulators. The chronological ordering of textual data also allowed the researcher to follow developments in BDA in minutes and other reports at the auditing standard setting level, in particular in the DAWG. Here, the minutes were also compared with transcripts from the interviews conducted with members of the DAWG in order to establish either consistencies or contradictions in their discussion of BDA. This was important because it would help in understanding intersubjectivity in the construction of BDA, as well as the way conflicts have been managed as BDA has been promoted and embedded.

Once the evidence was organised in this manner, coding was undertaken in line with the research questions, following the approach identified by Miles and Huberman (1994). First level codes were identified by only focusing on what was found in the interview transcripts and documentation. The aim was just to extract what was being described in the data collected regarding BDA. Several codes were identified which acted as collection pots for evidence, capturing what was said and written. These codes were repeatedly compared to establish congruence and differences. The purpose was to reduce the evidence in a manner that captured the four key areas of the research, namely promoting, embedding, properties of BDA and related challenges. The codes were adjusted to take into account what was being said in the academic literature as well as new evidence emerging from the audit field. The researcher was constantly moving between data collected and the auditing literature. This led to the analytic coding phase in which the theoretical constructs, namely legitimacy,
identity regulation and affordance were used to conceptualise and make sense of the data being analysed (see Table 4.3 for a summary).
<table>
<thead>
<tr>
<th>Research Questions</th>
<th>Theoretical constructs</th>
<th>Themes</th>
<th>Manifest content categories</th>
<th>Sources of evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RQ 1</strong></td>
<td>Legitimacy</td>
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<tr>
<td></td>
<td>Pragmatic legitimacy</td>
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<tr>
<td></td>
<td>(cosmological, value-based arguments)</td>
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<td></td>
<td>Moral legitimacy</td>
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<tr>
<td></td>
<td>(teleological, ontological, value based and historical arguments)</td>
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<td></td>
<td>Cognitive legitimacy</td>
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<tr>
<td><strong>RQ 2</strong></td>
<td>Identity regulation</td>
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<td></td>
<td>Targeting auditors</td>
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<td></td>
<td>- Auditors’ internalisation</td>
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<td>- Auditors’ commitment</td>
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<td>- Auditors’ value with BDA</td>
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<td>- Auditors’ status within the firm</td>
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<td></td>
<td>- Incentives</td>
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<td>- Training</td>
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<td>- Recruitment</td>
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<td>- Performance reviews</td>
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<td></td>
<td>- Auditors’ expertise</td>
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<td></td>
<td>- Regulators’ concerns about audit quality and use of BDA</td>
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<td></td>
<td>- Lack of standards</td>
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<td></td>
<td>- Conceptualisation of BD</td>
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</tbody>
</table>

**Table 4.3 Mapping theoretical constructs with themes**

- Audit world is changing due to technology (BDA)
- BDA offering insights and examples
- BDA and audit tender market
- Clients’ operational inefficiencies
- Rebuilding trust in audits
- Audit firms’ reputation
- Improving professional scepticism and professional judgements
- Reference to audit quality inspection reports and auditing standards
- Audit has to respond to changes in technology
- Transparency reports
- Brochures
- Audit firms’ surveys
- Professional bodies’ reports
- Interviews with partners, directors, managers, auditors, data analysts and regulators
- Regulators’ thematic reports
<table>
<thead>
<tr>
<th>RQ 3</th>
<th>Affordance</th>
<th>Configuration</th>
<th>Relationality</th>
<th>Challenges</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>- Operational scope</td>
<td>- Construction of audit expertise</td>
<td>- Autonomy</td>
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<td></td>
<td></td>
<td>- Operational depth</td>
<td>- BDA tools</td>
<td>- Status</td>
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<td>- Data analysts</td>
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<td></td>
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<td></td>
<td>- Audit teams</td>
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<td>- Location of audits (shared centres)</td>
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<td>- Reporting audits</td>
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<td></td>
<td></td>
<td></td>
<td>- Relationship between audit functions and others</td>
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</tbody>
</table>

- Structured audits
- Industrialising BDA
- IAASB reports and minutes
- Demonstrations of BDA proprietary tools
- Interviews with partners, directors, managers, auditors and data analysts
- IAASB reports and minutes
- Demonstration of BDA proprietary tools
Since the study has three theoretical constructs for analysing the empirical evidence, the analytic coding provides the means of linking the theoretical constructs to the themes that were identified to assist in addressing the three research questions.

Research question 1 addresses the promotion of BDA to relevant stakeholders with the aim of acquiring legitimacy. Since BDA in audits is still developing, the study specifically focuses on two dimensions of legitimacy, namely pragmatic and moral legitimacy (Suchman, 2005). However, attempts are made to address the cognitive legitimacy dimension through the challenges being encountered during the promotion process. Further, pragmatic and moral legitimacy are not mutually exclusive in practice but in this study are delineated for analytical purposes. Suddaby and Greenwood’s (2005) rhetorical strategies are used to analyse the way auditors spoke or wrote about BDA in their presentations and official documentation. The analysis of the evidence was conducted by exploring how audit firms frame their discussions on BDA to stakeholders, including clients and regulators.

Research question 2 addresses the way audit personnel are encouraged to use BDA in audits and other areas of assurance. Occupational identity as a means of organisational control is implicated in the process of embedding BDA into the audit function in the sense that methodological change can be viewed as conveying a change in auditors’ identity. The evidence indicates auditors as the target for identity regulation in the implementation of BDA tools in the audit process. The semi-structured interviews and textual data were analysed to find out how auditors portray themselves in general, during the audit engagement and in relation to others within the firm. While in research question 1, the evidence collected was drawn from publicly available official documentation and interviews with participants with positions of influence and access to clients and regulators to promote BDA, research question 2 relies on evidence from participants at all levels of audit firms and on textual evidence that relates to their roles in order to capture the dynamics of BDA within firms. Given that identity regulation is seen as a form of managerial control, the extent to which the evidence points to both explicit and implicit means of control is evaluated. Explicit means are captured in the textual data and interviews in which audit firms or administrators provide evidence regarding mechanisms put in place to encourage the use of BDA, such as training and performance
reviews. Implicit means are deduced from the evidence collected, with the researcher relying on previous studies of identity regulation and organisational control to deconstruct the essence of the narratives which the administrators provide. The researcher also investigates the means of achieving identity regulation with reference to literature on auditors’ socialisation processes to establish how training, recruitment and other means can be seen to regulate auditors’ identity. The evidence also captures the challenges associated with this process.

Research question 3 builds on question 2, since both look at how BDA is embedded in the audit process and function. However, in research question 3, the emphasis is on the role of BDA properties in reconfiguring the audit process. In particular, the properties of BDA are explored to investigate how they facilitate or constrain auditors in doing their work. The construct of affordance from sociomateriality is very useful for this purpose. In this context, affordance, as explained in Chapter 3, is viewed in terms of “reconfiguration” of the audit process and “relationality” within the firm (Wagner et al., 2011). Therefore, the evidence obtained including, importantly, that from observing illustrative demonstrations of audit firms’ BDA tools, is used to capture the interplay between auditors and BDA. In analysing the evidence, attention is paid to what auditors were narrating and illustrating with the BDA tools, in terms of how they enable and constrain the way they conduct audits.

4.4 Summary

This chapter has discussed the research methodology that the study employs based on its philosophical underpinnings and the research questions. In doing so, it has linked the research gaps, theoretical constructs and empirical evidence collected. The chapter situates the study in the interpretive paradigm in order to provide a holistic understanding of BDA in audits of financial statements. In this regard, a qualitative approach has been adopted as the research strategy, employing semi-structured interviews with relevant individuals in BDA and a review of relevant documentation published by stakeholders in the audit field as means of collecting evidence.
Together the interviews and documentation are analysed based on theoretical constructs, namely rhetorical strategies, identity regulation and affordance, to develop themes that are discussed in Chapters 5, 6 and 7, which present the findings of this study in relation to each of the three research questions.
CHAPTER 5: RHETORICAL STRATEGIES OF LEGITIMATION: PROMOTING BDA TO RELEVANT STAKEHOLDERS

As discussed in Chapter 3, audit firms have made claims that BDA is changing the way audits of financial statements are being carried out, suggesting a profound change in the audit field which is facilitated by BDA. However, this change cannot be assumed to be happening in a vacuum because the audit field is a very complex and political environment that requires a careful understanding of BDA as an audit innovation that could improve the provision of audits. This means that legitimacy has to be sought for BDA by linking it to the cultural values within the audit field. In order to do this, audit firms have to construct legitimising accounts which place BDA at the heart of the audit process. Previous studies on audit innovation have indicated that firms engage in various efforts to legitimise developments in the audit process (Matthews, 2006; Robson et al., 2007). This study examines use of rhetorical strategies identified by Suddaby and Greenwood (2005) to understand how firms promote BDA. The rhetorical strategies are then linked to a type of legitimacy (moral or pragmatic) sought by these firms. Table 5.1 summarises how audit firms promote the use of BDA and, in this way, help to co-produce the relevance of BDA in a data driven environment.

Table 5.1 Efforts and rhetoric in promoting the use of BDA and related legitimacy

<table>
<thead>
<tr>
<th>Efforts</th>
<th>Client Documents</th>
<th>Surveys</th>
<th>Transparency reports</th>
<th>Brochures</th>
<th>Surveys</th>
<th>Transparency reports</th>
<th>Audit quality inspection reports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Events</td>
<td>Tendering process</td>
<td>Annual conference (profession)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Breakfast meetings</td>
<td></td>
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</tr>
<tr>
<td>Legitimacy being sought</td>
<td>Pragmatic</td>
<td>Moral</td>
<td></td>
<td></td>
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<tr>
<td>institutional vocabularies</td>
<td>Value adding</td>
<td>Audit quality</td>
<td></td>
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</tbody>
</table>
The use of rhetoric to promote BDA is essential in this case because it acts as the means through which audit firms try to reshape the audit field, creating meanings and concepts which resonate with audits performed in the data driven environment. Therefore, this study contends that rhetorical strategies depend on the context, as such strategies are carefully choreographed to suit a particular audience, time and space.

The remainder of the chapter is organised in four sections as follows. Section 5.1 provides a discussion on the value of BDA to audits of financial statements by showing normative rhetorical arguments that portray it as an essential means of delivering audits. Section 5.2 extends the discussion of the rhetorical strategies which audit firms employ to secure pragmatic legitimacy. Section 5.3 discusses the remaining challenges associated with the promotion of BDA to relevant stakeholders. Section 5.4 concludes the chapter.

### 5.1 Moral (procedural) legitimacy: emphasising the potential of BDA for enhancing audit quality

It is appropriate to recognise that audit firms acknowledge that their use of data analytical tools is not entirely new. However, they argue that the temporal context in which BDA is being promoted is regarded as new because of the unprecedented level of data being collected, processed and labeled as BD. The evidence suggests that audit firms started making the significance of BDA in audits known publicly through their transparency reports (see Table 5.2) as well as to the regulators; in a transparency report from 2013 FRC (2014, p. 12) noted that, “three firms (of the Big Audit firms)... use[d] data analytics... the first time”.

<table>
<thead>
<tr>
<th>Rhetoric linking BDA to audit tradition</th>
<th>Value based</th>
<th>Value based, ontological and historical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhetoric linking BDA to BD</td>
<td>Cosmological</td>
<td>Teleological</td>
</tr>
</tbody>
</table>
Table 5.2 References to BDA or related terms in audit firms’ transparency reports

<table>
<thead>
<tr>
<th>Big Audit Firms-UK</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
</tr>
</thead>
<tbody>
<tr>
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This growth in the use of the term BDA in publicly available documents released by the Big Four firms provides evidence of how, in the words of Weick (1995, p. 86), “novel moments in organisations capture sustained attention and lead people [e.g. the audit profession, regulators and clients – author] to persist in trying to make sense of what they notice”, hence revealing an opportunity for the firms to discuss and contemplate the relevance of BDA in their work.

5.1.1 BDA as a means to restore “broken trust” in the quality of audit work

The issue of (lack of) audit quality has been a dominant theme among regulators, standard setters and politicians in the aftermath of the financial crisis (Khalifa et al., 2007; Holm and Zaman, 2012). Regulatory changes were made in the audit field to influence firms and to promote to audit quality. The publication of audit quality review reports by regulators is also argued to have an effect on the way firms conduct their audits (Carcello et al., 2011). This is leading audit firms to prefer more structured audits over auditors’ autonomy in forming judgements in order to demonstrate quality to regulators and in litigation cases (Power, 2003; Barrett et al., 2005). Further, Khalifa et al. (2007) argue that changes in audit technologies had also led to shifts in the conceptualisation of, and the discursive strategies, for audit quality. Extending this argumentation, BDA is discussed in audit firms’ publications and in the interviews (see below) conducted with senior partners as a technical and symbolic instantiation of audit quality.
Our approach means each audit is bespoke and forward-looking in terms of risks, which should ultimately deliver superior insight. Our use of leading-edge analytics technologies will improve audit quality and professional scepticism. For example, masses of company data can be analyzed in real-time with more efficiency, meaning anomalies or new trends can be identified and interrogated more readily. (Deloitte, 2014, p. 1)

EY is focused on investing in tools to improve what its member firms do, creating the highest-performing teams and building trust and confidence in the audits they perform. EY’s reputation is based on, and grounded in, providing high-quality, professional audit services objectively and ethically to every company we audit. (EY, 2016a, p. 3)

The FRC sent teams to look at our audit files and they are given ratings. So, one of the things we are doing is monitoring how, in many cases we are looking at analytics to improve the quality of our audits and reduce the number of deficiencies found so we are monitoring that. That is having a positive impact. Where we have applied analytics to a specific quality point, and the numbers have gone down. I would say an 80% reduction in deficiencies. (Director, D1)

The above quotes place audit firms at the centre of leading the developments in BDA in order to drive audit quality. The focus on “building trust and confidence” through BDA, which is regarded as improving “professional scepticism”, could indicate the impact BDA is having on meeting the audit quality threshold set by FRC. Many interviewees presented a teleological argument in demonstrating that BDA enhances audit quality. They argued that the use of BDA is a necessity for overcoming the challenges associated with the existing methods of collecting and processing audit evidence. The auditors are suggesting that the current methods are not fit for purpose in the current data driven environment as well as against the backdrop of the financial crisis. The financial crisis has prompted audit firms to place emphasis on restoring or building the trust which was perceived to have been lost. Both the financial crisis and the digitalisation of the audit environment have given auditors the impetus for teleological
argument in order to provide the rationale for radical change to the existing technologies. See
the extract below.

We’re now at a critical moment where we face a stark choice: either take decisive
steps to transform the audit so that it remains relevant, or see it drift towards
obsolescence... Companies today are grappling with rapid globalization, instantaneous
worldwide communications, a 24/7 blizzard of information – blending fact and opinion
– and constant scrutiny by an expanding array of stakeholders. (PwC, 2013, p. 10)

Therefore, BDA offers an opportunity to make a normative case for achieving audit quality in
a revolutionary way in which audit firms portray themselves as initiating change. This change
involves breaking from the past by modifying the way audit methods and procedures are
changing, as discussed in the next section.

5.1.2 BDA and breaking with the past of auditing

Teleological rhetorical strategies are meant to indicate that there is need for radical change
in the way technologies such as BDA should be used in the audit environment if the profession
is to retain its social relevance. Emphasis on radical change could be seen as attempting to
break the profession from the past, which is now regarded as associated with loss of public
trust due to the financial crisis. In this regard, in order to achieve the ultimate objective of
auditing, which is framed in the historical context, historical discursive strategies are also
employed. These extracts from PwC illustrate the claimed importance of radical changes to
“break from the past” whilst adhering to the audit tradition through constant reinvention:

Fast-forward to today and the business environment and value drivers are radically
different. But the common factor is that, as in 1840, we have a trust gap opening
between society – including investors – and companies. To close the trust gap this
time, the reporting model and the audit need to catch up with new business realities.
Like an iconic brand, the corporate reporting and audit model must evolve to stay
relevant. (PwC, 2013, p. 13)
We share our thoughts on how the corporate reporting and assurance model needs to evolve in the future. This evolution will only happen if the profession, and the large firms in particular, invest, innovate and experiment in order to stimulate change. Without evolution, the audit product is at risk of becoming irrelevant... Today's need to report complex financial instrument transactions will evolve into tomorrow's requirement to write algorithms that interrogate Big Data. (PwC, 2014a, p. 7)

Audit firms also use teleological arguments beyond restoring trust due to the financial crisis in order to persuade regulators that the current audit environment offers an opportunity to rethink how auditing should be conducted. Given that audits are conducted in a BD environment, firms attach BDA to the traditions of the audit profession through historical arguments but fuse these with teleological arguments to showcase the need to break with the past if audits are to remain socially relevant. This is achieved by claiming that the audit of the future is able to maintain the traditions of the profession, such as its ethics, by incorporating BDA into the process (see Figure 5.1).

Figure 5.1 The Audits of the future – PwC Transparency Report (2013, p. 10)

Audits of the future

Energy usage
Imagine if daily revenues from the utility giants were published on-line, with a PwC assurance opinion validating the data. We could take advantage of WiFi-enabled remote meter reading and build an algorithm to re-perform revenue calculations, using census data and energy tariffs to assess completeness and accuracy of revenue figures.

Ethical lending
Imagine developing a set of quantitative criteria that defined ethical lending activity. And imagine deciding to borrow from an ethical lender knowing that your lending terms had been assured by PwC as meeting ethical standards.

Predictive assurance
Imagine a suite of algorithms embedded in a mobile phone company’s operating systems which gave real time assurance over the integrity of all data flows. What if those algorithms then searched for relationships between external data, like travel information and local tariffs, and business performance – enabling companies to use PwC assurance to better predict the future.

The emphasis on moral legitimacy is heightened when audit firms attach BDA to the actual conduct of the audit process as a significant tool in the verification stage (Williams, 2013).
This suggests that BDA is regarded as enhancing the technical veracity of the audit process and assisting the assessment of risks.

Therefore, there is growing emphasis on the potential of BDA for reigniting trust in auditing and on the audit profession’s legitimate standing in society by transforming the way in which auditing is delivered (i.e. procedures, methods and techniques), with profound positive effects for the standard of audit work. Furthermore, there is evidence to suggest that auditors’ rhetoric implying the procedural legitimacy of BDA as a natural way of doing an audit also has ontological underpinnings (Suddaby and Greenwood, 2005), more existential in nature, which question the adequacy of extant audit approaches and place an emphasis on developments in BDA as an inherently superior solution to the problem of the growing information complexity of modern businesses.

The current audit model is not broken and has served stakeholders well in the past. It has however been constrained by technological limitations that no longer exist. Additionally, auditors find challenges in fitting the audit evidence derived from data analytics into the current audit approach required by the auditing standards. (Minutes of a meeting of the IAASB Data Analytics Working Group, 2016b)

But the challenge of building trust is growing as the pace of change accelerates. The technical skills and content we will need to create the future of assurance are changing... (PwC, 2014b, p. 7)

From the procedural point of view, the technical aspects that auditors have identified as benefiting the most from the use of BDA include assessment of audit risk, audit evidence gathering, performance of substantive and analytical procedures, and improvement of auditor judgement. In particular, interviewees point to a number of areas where BDA can improve the functionality of audit procedures, such as by enabling auditors effectively to reconstruct the client’s accounting process and more easily verify the validity of assertions. These possibilities have also been discussed in the audit literature with commentators (Cao et al., 2015) noting the opportunities for auditors to navigate messy data at a faster rate and
to work on critical areas by identifying material exceptions based on the analysis of the whole population. As one interviewee points out in this regard:

Another area is re-computation; there are areas within financial statements that are systemically generated by the client and, as a consequence, we can systemically test them. So, a classic example is depreciation interest calculations and certain aspects of provisioning. Historically, the auditors would do either a test to say “does the maths seem to be working” or do what is known as rationalisation. (Partner, P4)

Another commonly discussed consequence of BDA for the quality of audits concerns audit evidence gathering. The interviewees were eager to emphasise that audit evidence in the Big Data environment can complement traditional audit evidence by bringing in a variety of unstructured information relating to company performance. There were claims that BDA tools may assist in audit evidence gathering in a variety of ways: they facilitate and make possible full population testing; they offer the potential to widen the audit scope and they may enhance audit quality through more detailed analysis of accounting populations and improved auditor judgement. As one senior auditor comments:

Analytics can move you from haphazard sampling to statistical sampling. [...] I think we would all agree [that it] is more statistically valid in terms of the outcomes you would achieve at the end when the data volumes are large. [...] It is absolutely 100% transactions as opposed to some cursory examination by eye which just is not practical beyond a few thousand. So, that is quite dramatically different but is only doing stuff that auditors have had to do in the past, which is evaluate the transactions for appropriateness. (Partner, P3)

Prior studies have argued that many changes in audit procedures and techniques over the years have been presented by the profession as serving the purpose of improving an auditor’s judgement, specifically by means of codifying and streamlining the decision making process that supports that judgment (Newton and Ashton, 1989; Turley and Cooper, 1991; Dirsmith and Haskins, 1991). The empirical analysis for this study suggests that developments in BDA
in auditing should, in a similar vein, be positioned in the context of these longer term attempts to formalise the audit process. Claims have been made, for example, that the increased availability of data may contribute to audit quality by providing auditors with ‘tangible’ means to substantiate their assertions relating to key areas such as risk, audit scope or what constitutes appropriate audit evidence, and to defend those assertions subsequently. Further, greater reliance on Big Data may contribute to auditors’ efforts to improve the perceived trustworthiness of an audit judgement by anchoring it to extensive amounts of supposedly objective data about a company’s performance. Such possibilities are emphasised in public communications by audit firms. The excerpt below shows how one of the Big Four seeks to present their audit methodology, integrating elements of BDA as a formalised procedural tool:

[It is a framework] for delivering high quality audit services through the consistent application of thought processes, judgements and procedures in all audit engagements. Making risk assessments, reconsidering and modifying them as appropriate, and using these assessments to determine the nature, timing and extent of audit procedures are fundamental to EY GAM [Global Audit Methodology]. (EY, 2014, p. 16)

In principle, the ultimate success of auditors’ efforts to boost the procedural legitimacy of auditing through an emphasis on BDA and its potential for enhancing audit quality could be claimed if the technology were to receive some form of institutional support, such as through the revision of auditing standards. Some audit commentators (Krahel and Titera, 2015), echoing the profession’s view, have indeed advocated changes in international auditing standards to address issues relating to Big Data in auditing and to eliminate what they see as uncertainties around ways in which auditors engage with BDA environments. In particular, they have argued that the modern standards do not provide sufficient capability for BDA to be fully exploited in the conduct of an audit, and have called for the revision of specific standards, including ISA 240, 315 and 540 (Cao et al., 2015).
5.1.3 Efforts to demonstrate audit quality and value through BDA to regulators

The evidence also shows that audit firms use events such as conferences for professional accountants and other official documents to seek moral legitimacy. They also work with professional accountancy bodies to develop materials that could persuade their members to use BDA. However, it was noted that proprietary BDA tools are branded to provide a sense of uniqueness that could capture both pragmatic and moral legitimacy.

To illustrate how an event is used to seek moral legitimacy, three audit firms presented capabilities for BDA which could improve audits of financial statements at the Accountancy Europe (Formerly Federation of European Accountants – FEE) Annual Audit Conference in Brussels, June 2015 (see Figure 5.2).

Figure 5.2 FEE Annual Audit Conference Programme (Accountancy Europe, 2015)

The presentation tackled two potential areas of BDA, namely social listening and process mining. The presenters attempted to link social listening to an auditor’s understanding of an entity’s external environment (ISA 315) and process mining to the opening of the “auditor’s black box”. Power (1997) indicated that the process of auditing is kept behind the curtains. In this presentation, it was clear that BDA was being portrayed as a tool that would enhance understanding of the client environment, as well as providing transparency in the audit process. This rhetoric suggests a value-based strategy for the role of BDA. The presentation also highlighted the teleological argument by showing that audit firms are actively engaged in researching problematic areas of auditing, such as impairment of assets, to develop BDA tools that could address such challenges.
Besides presentations at conferences, the evidence indicates that audit firms work closely with professional bodies to circulate the ideas of BDA among their members. For instance, several projects on BDA have taken place between professional bodies and audit firms which have so far led to publication of research-based documents, such as *Data analytics for external auditors* (ICA EW, 2016) and *Big data and analytics, what’s new?* (ICA EW, 2016b), in which the argumentation is very much value-based but targets a different audience. See the extracts below.

Auditor data analytics is about enhancing audit quality. There are different angles on what this means in practice but audit quality is a common objective of auditors, regulators and standard-setters alike. A high quality, focused and effective audit is aligned with the way the audited entity manages its data and operations. Data analytics offers a practical way for auditors to manage some important aspects of IT systems in larger audits. (ICA EW, 2016a, p. 1)

When analytical techniques are applied effectively to big data, businesses can potentially achieve many incremental improvements – personalised services, optimised operations and better risk management, for example. Furthermore, the high pace of technology development and the sheer volume and breadth of opportunities to use data will increasingly influence the business environment and provide opportunities for disruptive new business models. (ICA EW, 2016, p. 2)

The first quote is geared towards appealing to regulators for moral legitimacy by presenting BDA as enhancing audit quality, while the second one tries to secure pragmatic legitimacy as the ICA EW urges its members to appreciate the novelty in BDA which could add value to their organisation’s operational efficiencies.

Further, audit firms share their expertise and experiences with the standard setters with the effects of BDA in audits of financial statements. The establishment of the IAASB data analytics working group in 2015 and its advisory panel in 2017 provides evidence for representation of
senior partners of the Big Four. For example, all the members of the working group are partners of large firms. Further, the rhetoric used in the deliberation appears to be largely value based, but there has been a shift in the rhetoric with regards to how to make change and what its pace should be. Initially, when the working group was established, the tone was more teleological, suggesting radical and instant change.

Audit firms’ engagement with professional bodies, regulators and standard setters could largely be viewed as promoting moral legitimacy. Audit firms also actively rebrand their audit methodology to provide an image of change and newness in the data driven world. They also work with technology companies to develop and leverage the use of BDA.

As a firm, we are making strategic acquisitions and partnerships. For example, Alteryx is a data analytics tool and we have started partnering with them. Spotfire is a visualisation tool; it is now made available, is now on every single employee’s laptop... One of the things I say, [auditors] can’t stay ahead of technology because it moves so quickly, so we are more interested in leveraging the technology that is already out there; they are experts in technology. What we are trying to do is use their technology and apply it to audit and assurance, rather than trying to build our own technology.  
(Director, D1)

As a result, they also give BDA tools proprietary names and rebrand their audit methodologies.

Many audit firms recognise that BDA is becoming influential in the way they market themselves to potential and existing clients. Those firms using off the shelf BDA tools such as Spotlight are rebranding the audit approach as opposed to the actual BDA tool. For instance, in 2014 Deloitte introduced an audit approach called “Distinctive Audit”.

The Distinctive Audit provides a number of tools to support us in delivering the Global Audit Imperatives. For example, one area which supports us in our application of professional scepticism is the use of analytics. By leveraging technology, we are
transforming our audit process with a clear focus on the judgements and audit risks that matter through implementing improved sophisticated analytical capability. (Deloitte, 2014, p. 3)

Similarly, EY in 2015 introduced a revised audit methodology and called it EY Canvas.

Some audit firms have developed their own BDA tools and given them unique names. Initially, PwC in 2014 introduced their own BDA tool called Halo® which was promoted using value based and historical argument. See the extract below.

And we’ve developed ‘Halo’ – a next-generation software application that analyzes and assures data using a suite of algorithms built on 165 years of PwC experience. Halo uses state-of-the-art interrogation techniques to analyze data, and visualisation tools to reveal to assurance professionals what’s right and what requires further investigation – it can help companies strengthen each of their lines of defence providing 21st century assurance. (PwC, 2015a, p. 15)

The way these approaches and tools are promoted covers a number of different areas. For instance, Distinctive Audit was portrayed as forward looking and addressing clients’ challenges; it went on to be described as promoting auditors’ professional judgement and scepticism. EY Canvas, however, has an emphasis on providing a structured audit approach through technology. Equally, Halo is also portrayed as providing a structured approach to audit, while Clara has gone for providing the appeal of transparency.

5.2 Pragmatic legitimacy: enhancing the value and relevance of auditing to clients

In promoting BDA to clients, audit firms portray the introduction of BDA technology as inevitable, given the context in which audit firms are operating. Therefore, in the following
sections, a discussion is set out on how audit firms justify the use of BDA and on the efforts undertaken, in the form of surveys and events, to target clients.

5.2.1 Presenting change as inevitable

The evidence collected indicates that audit firms’ attempts to secure pragmatic legitimacy involve positioning the audit field as experiencing a general transformation because of technological advancements and regulatory changes. In relation to technological advancements, audit firms have argued for some time that the environments in which audits take place are being affected by digitalisation of clients’ systems that collect and process large amounts of data. While not specifically calling this Big Data, some audit firms acknowledge that platforms which clients use to store and process information (ERPs) now collect data which were not previously used as evidence for audit purposes. The interview excerpts below illustrate this point.

I don’t believe [in Big Data]. For me, there is this notion of Big Data but we are nowhere near it in our organisation and our business. Big Data is people like Facebook, Google – that is not us. We are not those people. (Partner, P1)

If you think of a traditional audit, your data sources are ERP and financial systems. However, now clients, stakeholders and others also want to hear about unstructured data, they want you to talk about emails, external data and so on. (Director, D2)

The advent of new social media (Suddaby et al., 2015; Arnaboldi et al., 2017) is now having implications for what can potentially be seen as audit evidence. Given that information being collected in ERPs is changing to include unstructured data and non-traditional audit information, audit firms feel it is inevitable that they have to respond to such changes to remain relevant. Therefore, the development and use of BDA is regarded as a logical way of responding to the inevitable changes in clients’ environments due to Big Data. The two extracts below, from senior executives in two of the Big Four, acknowledge the challenges presented by the inevitable changes in technology and the implications of these for auditing.
A recent study by Oxford University of 700 occupations at high risk of being disrupted by technology – accounting and auditing was number two on the list... with a 95% certainty that machines will replace us... We need to wake up. We’re living in a Big Data world where a huge amount of insight into a company can be obtained from sources other than the company itself. This data is easy to access and can be analysed with powerful tools in “real time”. This is transforming our ability to analyse corporate performance. (Director, D2, quoting his audit firm’s CEO)

I painted a picture of a world in which competition is intense, business models are being continually challenged and value is no longer measured in purely financial terms. All this against a backdrop of instantaneous worldwide communication – blending fact and opinion – and under the constant scrutiny of an ever increasing array of stakeholders... the changes in our profession are put into perspective by those elsewhere. Take technology: we’ve seen Google launch the world’s first driverless car. (James Chalmers UK Head of Assurance – PwC, 2014, p. 11)

This way of presenting the genesis of BDA relates to what, in terms of Suddaby and Greenwood’s classification of rhetorical strategies, might be considered a cosmological argument because audit firms present change as an inevitability beyond the control of the audit firms and the profession as a whole (Suddaby and Greenwood, 2005). Audit firms show that the digitalisation of clients’ systems affects the nature of the audit environment. They state that clients demand audits that meet regulatory requirements and add value to their operations, as the extracts below indicate.

The audit world is changing. The new, emerging audit paradigm has to reflect a more competitive audit market driven by a focus on audit quality. It must also respond to other current developments affecting our working environment, such as the proliferation of data, digital disruption, and a pervasive public cynicism towards business. If audit is to remain relevant it must address such challenges, including the changing expectations of stakeholders. (EY, 2016a, p. 8)
Although much of this regulatory change is not yet officially in place, the marketplace has already begun to respond. [...] We expect competition to become even fiercer next year... we’re already seeing Audit Committees making appointment decisions based on their assessment of audit quality above all else. (Head of Audit – PwC, 2014a, p. 4)

The audit tender market means there is a huge amount of pressure to innovate and to bring analytics technology into an audit. Because we only need to say something in proposals to try to win clients and try to drive efficiency. (Director, D2)

It could be argued that claims of clients’ demands, regulatory imperatives and competition from technology companies are also framed to problematise the audit environment with BD, while at the same time expressing the value that BDA could offer to clients and the relevance it could bring to auditing in general by addressing those challenges. The suggestion of auditors’ interaction with BDA as the solution to the challenges of BD is evidence of value-based rhetoric (see next section). BDA is thereby linked to addressing the immediate needs of immediate clients (exchange legitimacy) as well as demonstrating how BDA addresses the concerns of auditing at the programmatic level (influence legitimacy) and the audit firm’s own competitiveness (dispositional legitimacy). Failure to address the challenges would potentially affect the competitiveness of audit firms and the relevance of the audit profession. The extract below indicates how BDA is linked to addressing some of the concerns associated with sources of change.

We are finding that more sophisticated buyers are seeking to reduce the cost by running shorter tenders and by providing more comprehensive data, resulting in fewer management team meetings. It has become more commonplace for audit committees to confirm independence prior to starting the process. This is important given the restrictions companies face in choosing non-audit service providers while the tender process is running. Companies are also interested in innovation from audit firms including the capacity to interrogate complete data sets and to offer more forward-looking assessments of risk. (EY, 2014a, p. 4)
Therefore, in order to show the value of BDA to clients, audit firms complement cosmological rhetoric with value-based arguments in order to demonstrate that the challenges associated with BD can be turned into opportunities for the client’s business and for the conduct of the audit. This evidence suggests that cosmological rhetoric is being used to highlight the state of affairs of the audit field and its associated challenges. Presenting BDA as adding value to the clients could be regarded as the means through which audit firms try to meet both technical and organisational goals.

5.2.2 Efforts to demonstrate the value of BDA to clients

The discussion above relates to audit firms problematising the audit environment as characterised by BD, regulatory changes and fierce competition, thereby prompting the need for clients and auditors to respond to such exogenous factors. It has become clear in the evidence collected that audit firms have positioned BDA as the tools that could overcome these challenges. With particular focus on the clients as their target audience, some audit firms point to the benefits which could be derived from exploiting Big Data. Therefore, audit firms use various platforms such as networking to interact with their clients as part of efforts to promote BDA. They also use activities such as surveys to provide an objective reality of the BD environment and to overcome uncertainties. For example, at a breakfast event, one audit firm indicated that the amount of data being collected would double in the next two years and also that there is around £216 billion worth of opportunities to be tapped (see Figure 5.3 below). The aim is to seek pragmatic legitimacy from clients.
To demonstrate credibility for the amounts being indicated, audit firms have cited figures in their publications from reputable consultancies such as Gartner and business research portals such as Harvard Business Review. The cosmological argument is demonstrated by showing that the “global and analytics services market” for BD would go up by 50% in the years to come. The term “global” represents the universality of BD which is important in showing that the phenomenon is inevitable. Audit firms then link this inevitability of BD to the available analytics to show path dependency and the value which BDA generates for the client. The audit firm brochure highlights a 90% increase in operational efficiency for those clients using it. This projection of BDA and its value in the audit environment combines cosmological and value-based rhetoric. The aim is to demonstrate the “goodness” in exploiting opportunities associated with BD that could add value for the clients (Suddaby and Greenwood, 2005, p. 56). BD is regarded as an untapped resource which has presented itself to clients but which requires expertise from those entrusted with the capabilities to operate BDA, such as audit firms.

At the same event, the brochure portrayed BDA as “here to stay – you have got to embrace it”, which also suggests a cosmological rhetorical strategy. In fact, it acknowledged that some clients have BDA but went on to downplay the significance of tools, which “are important but
not the most important aspect”. The aim was to place the audit firm at the centre of the “most important aspect”, which is analysing the BDA results. That way the audit firm could benefit from BDA related consultancy services. See Figure 5.4 below.

**Figure 5.4 PwC breakfast session (PwC, 2016b, p. 19)**

*To recap*

Data analytics is here to stay - you have got to embrace it!

Benefits of coverage, pace, insight, trend analysis and cost effectiveness are compelling

You have to keep up with those you are reviewing

There are many options available to source the skills you need

Tools are important but not the most important aspect

Robson et al. (2007) indicated that the official publications from audit firms promoting audit technology (BRA) as a novel practice for conducting an audit were also meant to claim expertise in risk management, thereby broadening the areas in which audit firms could offer assurance services. Similarly, in the BD environment, most audit firms express their expertise and capabilities in BDA to demonstrate their ability to assist clients in exploiting BD opportunities. To do this, they use value-based rhetoric in two ways. First, they claim that they invest significant amounts in BDA tools and related capabilities. By indicating the sums of money being invested, audit firms express commitment to the audit technology and also try to appeal to the audit field, in particular to the client, that they have adequate resources to overcome the challenges that BD could bring to the clients and the profession. Also, such investments indicate a long term view of the relevance of BD and use of BDA in the audit field. The extract below is an example of how value-based rhetoric, which is focused on the approach of firms to tackling challenges associated with BD, is presented in the publicly available documents.
We are taking a consistent approach across our international network, in over 150 countries, as part of a $400m global Audit Transformation programme. We are also working hard to innovate using new data analytic techniques and an expanded range of services, including updated ways of assessing corporate culture and integrity. These developments represent some of the most exciting opportunities for the audit profession in a generation. (EY, 2015a, p. 3)

Second, they try to convince clients to see the value of BDA through self-sponsored surveys in which respective ERPs in clients’ operating environments are portrayed as lagging behind in data analytical tools that capture the relevant information that could add value to the business. Most surveys (see Table 5.3 below) claim to have interviewed key individuals in the industry and in that way the authority of the surveys is enhanced.

**Table 5.3 List of selected surveys which Big Four audit firms conducted on BDA**

<table>
<thead>
<tr>
<th>Audit Firm</th>
<th>Survey Title</th>
<th>Year</th>
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<tbody>
<tr>
<td>KPMG</td>
<td>Going beyond the data: Achieving actionable insights with data and data analytics survey</td>
<td>2013</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2014</td>
</tr>
<tr>
<td>KPMG</td>
<td>Building trust in analytics</td>
<td>2016</td>
</tr>
<tr>
<td>KPMG</td>
<td>Seeking value through Internal Audit</td>
<td>2016</td>
</tr>
<tr>
<td>KPMG</td>
<td>Driving Business Performance using data analytics</td>
<td>2016</td>
</tr>
<tr>
<td>PWC</td>
<td>Global data and analytics survey: Big decisions</td>
<td>Annually since 2014</td>
</tr>
<tr>
<td>EY</td>
<td>Global Forensic Data Analytics Survey</td>
<td>Annually since 2014</td>
</tr>
<tr>
<td>Deloitte</td>
<td>Analytics aptitude A survey of internal audit analytics Maturity in Financial Services</td>
<td>2016</td>
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</table>
Normally such surveys raise concerns about research rigour and the independence of those assigned to do the research on behalf of the audit firms. However, in this case the structure of the narrative and the emphasis on the figures in the surveys is what is significant for the purpose of this study, because this shows that audit firms use value-based rhetoric to present the utilitarian view of BDA to their clients. The following extract from KPMG’s *Building trust in analytics* illustrates this point.

> Given the power that it holds, trust in D&A should be a non-negotiable business priority. Yet our survey reveals that this may not be the case. In fact, 60 percent of organizations say they are not very confident in their D&A insights. Only 10 percent believe they excel in managing the quality of D&A. (KPMG, 2016a, p. 6)

Also, the survey presents BDA as a necessity which the business must have to succeed, but then quickly points to the lack of appreciation of BDA by clients.

> Despite this clear worry about the trustworthiness of their D&A, 77 percent of organizations still say that their customers trust their organizations’ use of D&A. Yet fewer than half are sure that their organizations actually track their customers’ views on the use of D&A. (KPMG, 2016a, p. 6)

The survey then suggests that respondents do not utilise BDA sufficiently, despite 77% of the respondents indicating that they trust BDA in addressing some of the challenges in their organisations. The strategy which audit firms use in this context involves highlighting high figures such as 60% and 77% to demonstrate significance and, it could be argued, to influence others to think that BDA addresses most of the key areas of the business.

In another survey by the same firm, value-based rhetoric is adopted to show that BDA is significant in addressing the important areas of the business, from fraud detection to finding new customers. See Figure 5.5 below.
Value-based rhetoric can be seen here in the sense that all the areas relating to financial reporting and regulatory compliance in the context of auditing appear to have scored around 70%. However, those areas that could be regarded as less important, as far as regulatory compliance is concerned, for audit purposes and those that could be relevant for BDA related assurance services have scored around 68%. While the observed gap between the highest (71%) and lowest (65%) responses is very small, it could be argued that the symbolic aspect of the gap could be significant in explaining the way audit firms view the role of BDA. It could suggest that BDA is being used both for audit purposes as far as complying with regulatory imperatives is concerned and to assist in enhancing operating efficiency and competitive advantage. This highlights the blurred role of BDA for audit and non-audit purposes. Further, the survey is carefully framed to suggest that quantified benefits of BDA have been enjoyed by other clients who have already started using BDA. This kind of presentation offers the evidence which audit firms have compiled on BDA as scientific and rational, which is
important when professions showcase their abstract knowledge about a particular domain (Power, 1997).

Auditors therefore claim that BDA provides the ability for clients to examine it in great detail. In doing so, audit firms offer clients a competitive advantage because they are able to understand their operations better. However, audit firms go on to emphasise that most clients do not have the expertise to utilise BD and BDA. The lack of client expertise in BDA places audit firms in a position of opportunity to offer them BDA related assurance services, such as data assurance or risk advisory services. Here, auditors suggest that BDA provides outputs in the form of “insights”, which are mostly described in the context of general operational efficiency problems, such as “revenue leakage”, or accounting related concerns, such as “potential fraud”, that need to be addressed or prevented. Auditors’ efforts “to determine the practical consequences” (Suchman, 1995, p. 578) present audit firms’ BDA systems as capable of generating data processing tools that could also be used to help their clients to better manage their businesses.

Therefore, from the auditors’ point of view, the insights are either the value-adding aspect which BDA brings to the audit process or a standalone product produced by the firms’ BDA-related assurance function, sold separately as a non-audit service. The latter view is associated with a long history of tension between the audit profession and regulators because it potentially challenges auditors’ independence but generates more revenue for the firm to remain competitive. The former view, on the other hand, conceptualises BDA as a means through which the relevance of auditing is maintained in a data driven environment, and this is the subject matter of the discussion that follows.

5.2.3 Promoting BDA by demonstrating its value to the audit process

As discussed above, the outputs of BDA provide opportunities for auditors to gain significant additional insights into aspects of a client’s business; they also yield opportunities for
identifying additional services to offer to their clients, particularly those that are more advisory in nature. As partners in two large audit firms stated in interview:

Certainly, over the past few years the relevance of audit has been questioned by almost all of our constituents (clients and regulators). I think the use of BDA and sharing insights from that with client’s management really will go a long way to making clear how the audit is relevant today. (Partner, P5)

[Another issue] is insights; if you like, value added. Given that we already have this data and have done this analysis, what can we give back to the client at almost no additional cost to us? (Partner, P1)

The quotes suggest that, with BDA, auditors are going beyond the statutory requirements of the audit process to make sure that clients are also benefiting significantly from the process. Some audit firms argue that audit committees want more from the process than mundane tasks aimed at complying with regulations or auditing standards. Here, firms are using value-based rhetoric to suggest that audits of financial statements should not be viewed only as a routine imposed by regulatory imperatives. See the extract below.

We see audit as an opportunity, not an obligation, we go broader and deeper beyond statutory requirements, to realize the value of the data that’s available. We help organizations take stock of their financial statement, learn about their performance, understand where they could be doing better, and prepare for what the future may bring [“Data and Analytics – Unlocking the value of audit.” (KPMG, 2014a, p. 2)]

Presenting audit as an opportunity resonates with the discourse of market-based rationalities in which businesses have to strive to constantly seek opportunities that could help them excel. Further, BD is discussed in the context of the opportunities it might bring when effectively extracted and analysed using BDA. Therefore, linking audits of financial statements to the vocabulary of “opportunities” has the appeal of connecting the use of BDA in audits to
the value system of market-based economies. It also enables insights to be seen as a natural byproduct of the audit process, thereby reducing any concerns over auditors’ independence.

Some audit firms argue that the insights generated during the audit process enable the relevance of auditing in the data driven environment. One possible interpretation is that the pragmatic legitimacy of BDA tools co-produces social relevance for auditing. When audit committees see the benefits of insights generated by BDA tools, they may appreciate the role of auditing more. This point is illustrated by the following comment from an interview in an audit firm which has developed a financial stress index to measure staff efficiency, the implications of which were discussed with the audit committee.

We brought to the client’s attention the top journal poster [who] sits in the treasury function. This raised the most animated conversation within the audit committee, not so much about that there was anything inappropriate going on. It was more about why does this person have to post so many transactions. What’s going on in treasury? What’s the opportunity there? Why don’t we have better automation? What does this mean for our wider business and how we run finance? So, it is interesting sometimes that people don’t just appreciate senior management on some of the practical and very expensive things that are going on in their organisation but also the operational risk that they represent. (Partner, P6)

The quote above, which attributes the adding of value to clients’ operations to BDA, points to another dimension regarding BDA adding value to the audit process, through improving auditor-client interaction. Auditors have made claims about the potential for BDA to improve the general relevance of auditing by enhancing their clients’ experience of the audit process and the auditor-client relationship. In particular, several auditors interviewed made reference to BDA as a technology capable of producing more “visually appealing analytics to impress clients” (Earley, 2015, p. 3) by visualising the “thought process” behind auditor judgement, which arguably may contribute to the perceived usefulness of the audit function to the client. This is vividly illustrated by the following interview excerpt.
We have had some feedback from one of our biggest clients when we first introduced the major piece of analytics into their audit; this probably goes back to four to five years now since we first started. They have huge shared service centres and the guy who runs the centres commented at the end: “Now we feel like we know what has really been audited this year.” (Partner, P2)

In addition, many of the auditors interviewed also referred to the role that BDA can play in helping resolve disagreements between client and auditor, specifically on areas involving a significant amount of judgement,

If you go to that client and say: “Well, we have checked that last twenty years of data and we have predicted the fine pattern for the next year, or the gas price;” or “From all our calculations, there is no way you are going to make revenue X. It is going to be way less, and we think you should impair.” That’s what it will do. It will give weight of evidence so those professional judgements conversations are based on facts. (Partner, P1)

The above discussion highlights an emphasis on BDA as a tool, among other things, to improve and optimise client business, which suggests a portrayal of the role of the auditor as someone there to assist the client rather than to act simply as a watchdog over their financial reporting. From this perspective, the audit process is effectively a learning process for auditors as it provides ways to map out the future of the client’s business and hence test potential areas for promoting other services. The idea that audit is not an ‘obligation’ but an ‘opportunity’ (as pointed out by the aforementioned report by KPMG) points to auditors’ intent to emphasise the purpose of auditing as a function supporting the interest of the client (in unlocking an organisation’s potential) rather than as a more conventional verification exercise. The use of analytical metrics to make auditor judgements ‘visible’ to clients may assist audit quality if it enhances the auditor’s ability to influence financial reporting. A critical issue remains that, while yielding a potential to enhance the pragmatic legitimacy of the audit function, auditors’ reliance on BDA may also have adverse consequences in the form of
favourable bias towards client businesses and the possibility of public raising of further concerns about auditor objectivity, independence and due care.

In order to overcome these critical issues, audit firms try to demonstrate that BDA is an important audit technology in enhancing audit quality. The aim appears to be to secure moral (procedural) legitimacy. In the next section, a discussion on the rhetorical strategies designed to appeal to moral legitimacy is presented.

5.3 BDA in auditing and challenges on the road to cognitive legitimacy

The promotion of BDA is not unproblematic since the audit field attracts stakeholders with diverse interests. Fischer (1996) showed how audit technology has to be considered legitimate first before it can be regarded as appropriate and desirable among various stakeholders. In a similar vein, if BDA is genuinely to enhance trust in auditing and its legitimacy and sustainability, it can only do so to the extent that the technology itself is considered legitimate or, in other words, is thought of as a natural way of doing an audit by the audit professionals themselves. Suchman (1998) referred to such a taken-for-granted status as cognitive legitimacy, which exists “when alternatives become unthinkable, challenges become impossible, and the legitimated entity becomes unassailable by construction” (p. 583). Evidence in this study points to a range of areas representing challenges that audit firms face when promoting BDA to relevant stakeholders. These are regulators’ scepticism about the actual use of BDA in audits, auditors’ ambivalence about the conceptualisation of Big Data, the status of the audit function relative to other functions such as data assurance within firms as regards delivery, and auditors’ expertise in BDA.

5.3.1 Regulators’ concerns about loose coupling

The rise of BDA technologies in the audit context is a relatively recent trend; however, there are significant developments taking place at the regulatory and standard setting levels in understanding the implications for BDA in audits of financial statements. Such developments are regarded as important in making sure that the use of BDA is codified and made accessible
in auditing standards and other regulatory guidance. The evidence suggests that audit regulators also appear to acknowledge the possibility of a discrepancy between auditors’ claims about the use of BDA contained in, for example, audit reports and the actual reliance on the technology in the process of carrying out an audit.

The question is, as regulators, we need to look at how auditors have used those analytics. You said in the audit report that’s what you have done. We will then look at the audit file and one of the things we do in our inspections is consider how accurate these descriptions in the audit reports are. Are they really truly reflecting what it is that the audit team has done? So yes, firms are starting to put it [claims about the use of BDA] into their audit reports more, but the thing we are concerned about is: How fair is that representation? (Regulator, R2)

The above quote indicates that use of BDA could be overemphasised and this has implications for whether the use of BDA is indeed transformational. As empirical analysis shows, BDA is presented by some auditors as the next major shift in the delivery of an audit, but there is also evidence of opposition.

5.3.2 How big is Big Data in auditing?

There is a notable degree of scepticism among other audit professionals in refusing to see the audit environment as a BD environment. This scepticism focuses on a range of issues. For example, some participants, as mentioned, voiced an opinion that the amount of transactions that auditors analyse remains small, and so they effectively leave unexplored much of the information that is labelled as BD. They argue, for example, that the use of media and social platforms has, at least at present, little place in the conduct of the audit, which appears to contradict suggestions by some commentators that the resources available on such social platforms could transform the way audits are conducted (Cao et al., 2015). Even if it is accepted that BDA can indeed be a significant tool to improve the quality of auditor judgement, there is also evidence to suggest that auditors may not always be well equipped to deal intelligibly with large amounts of information, and commonly face challenges from
information overload and the difficulties of distinguishing relevant information (for further discussion, see, for example, Brown-Liburd et al., 2015). Also, the veracity of the data itself is another major source of risk, having direct consequences for the question of what should and should not be classified as audit evidence in the BDA environment (see Ramlakun, 2015).

This discussion provides evidence of uncertainty among not only audit commentators and regulators but also auditors themselves as to whether the main impact is simply through greater processing power enabling larger audit samples, or through the use of genuinely more superior techniques and new forms of evidence to enhance the quality of audit. The breadth of transaction streams and balances to which BDA audit tools are being applied is also unclear. In the light of the trend towards more formalised audit approaches, a key issue with BDA in auditing is the extent to which it may reconfigure the balance between judgement and structure. In particular, there is a danger that, instead of improving the quality of auditors’ approaches to work and their judgements, what BDA tools may actually promote is a deepening of what some see as a worrying reluctance for auditors to take a professional stand unless they have ‘scientific’, ‘concrete’ tools to justify their decision to a senior colleague, quality inspector or regulatory body (Knechel, 2007). Evidence for this latter perspective can be seen in the recent transparency reports prepared by the Big Four firms in which one of the impressions given is that analytics is conceived of as a means to enhance uniformity in audit judgement (see, for example, EY, 2014).

5.3.3 Intra-firm status of audit function and auditors

Other concerns relate to the extent to which BDA can in principle enhance the cognitive legitimacy and sustainability of auditing both as a profession and as a function. The analysis reveals concerns that the opposite may occur, specifically as regards to BDA leading, at least to a certain degree, to the dilution of auditors’ knowledge base and to further marginalisation of auditing within the multidisciplinary audit firm. As the interview excerpt below demonstrates, the potential consequences of BD concern not only the way in which an audit is delivered but also its standing within public practice firms, as against other related services that they provide.
All firms are investing in data analytics and are looking at them from two angles: advisory services, there is that side, and of course there is also the audit side. But there is an enormous emphasis on advisory. (Partner, P5)

This comment suggests that the fluidity of the boundaries between auditing and consultancy may be affected in an era of BDA (Humphrey and Moizer, 1990). That fluidity can be influenced too by the scale of investment required in the process of developing and maintaining BDA algorithms, software and tools. It is unlikely that auditing alone can generate sufficient resources to support the necessary investment and consequently the auditor will inevitably end up using analytical tools which have been created with the needs of other services and generic purposes in mind. The tools themselves may therefore not reflect purely a conventional audit mindset.

What I deliver through the [BDA] platform we built has to use the data that we got from the audit. Then you ask: What insights can you draw from this information? And what are the dimensions of the data that I can play with? (Partner, P6)

5.4 Summary

This chapter shows how audit firms are promoting BDA to relevant stakeholders outside the audit firms. The focus has largely been on those stakeholders outside the firm and the rhetorical strategies being employed to demonstrate BDA as a novel way of doing audits and also as the means through which effective audits would be conducted in an era of BD. Rhetorical strategies are constructed in a manner which is designed to either stimulate more public trust in auditors’ commitment to audit quality or to add value to their clients. The evidence shows that audit firms use cosmological arguments to secure pragmatic legitimacy by promoting BDA as tools that could enhance the value of audits through provision of insights to clients and also enhance the relevance of auditing in society. Further, audit firms employ teleological, ontological and historical arguments to provide a moral dimension to BDA and to demonstrate that it enhances audit quality. While the discourses of audit quality and adding value to clients involve variations in the rhetorical strategies being advanced,
common in both discourses are value-based arguments which are presented to highlight the utilitarian aspect of BDA to both audit firms and clients, as well as to normatively connect BDA to a wider belief system of auditing. In this regard, audit firms’ efforts can be seen to underscore primarily the pragmatic and moral utilities of BDA in auditing but face as yet unresolved challenges regarding the possibility of attaining cognitive legitimacy. Such challenges now require intervention from standard setters to provide guidance on the use of BD in audits. There is also a need to demonstrate that what is being promoted in publications is actually operationalised at the practice level. Prior studies suggest that the implementation of audit technology has resulted in unintended outcomes because practitioners have often been reluctant to use the technology (Fischer, 1996; Curtis and Turley, 2007). Some have suggested that changes in audit technology are a form of re-imaging of auditors’ status and identity (Robson et al, 2007). This could suggest that change in audit technology may also have implications for auditors’ identity. Therefore, the roles and identity of auditors in the data driven environment could be significant in effecting the change associated with the introduction of technology such as BDA in auditing. This issue has largely been unexplored in the research literature to date. Therefore, in the following chapter, an attempt is made to interpret and understand the process of embedding BDA within the audit process using the notion of identity regulation as a discursive strategy.
CHAPTER 6. ENCOURAGING AUDITORS TO USE BDA IN THE AUDIT FUNCTION

The previous chapter provided evidence that shows the ways audit firms promote the use of BDA in audits of financial statements. The chapter mainly addressed the promotion of BDA to relevant stakeholders outside of audit firms, namely clients and regulators. It focused on rhetorical strategies which audit firms use to portray BDA as a means of gaining pragmatic and moral legitimacy. It could be argued that audit firms make claims “to specific activities and expertise [about BDA,] the nature of the claims [being] influenced by their histories, allegiances and struggles with other occupations and economic institutions” (Cooper and Robson, 2006, p. 416). However, as observed with previous developments in audit technologies (Fischer, 1996; Curtis and Turley, 2007), such claims are not fruitful if the audit practitioners who conduct audits neither use the technology nor see the value of it (Fischer, 1996) for their audits. To address this challenge, audit firms (administrators) find means of encouraging members (i.e. auditors) to use technology (BDA), since failure to successfully embed it could undermine the firm’s legitimacy. Thus, the process of encouraging auditors to use technologies such as BDA requires concerted efforts to gain organisational control by the administrators (Covaleski et al., 1998).

Previous studies have explored the means by which new technologies have been embedded in daily audit routines, for example through revision of audit manuals (Humphrey and Moizer, 1990; Curtis and Turley, 2007) and professional training (Robson et al., 2007), in other words a rather narrow, formalised and prescriptive range of mechanisms for guiding and controlling individual auditors’ approaches to practice. The premise developed in this chapter is that many methodological changes in auditing effectively entail the need for auditors to adopt new professional identities and roles. Therefore, alongside direct measures to prescribe new practical approaches to audit work, such changes may also be pursued through more indirect means of influence, targeting auditors’ professional selves, their motivations, values and incentives.

Alvesson and Willmott (2002) refer to such measures as implicit forms of organisational control which link organisational goals with the “insides” of the organisation’s members, i.e.
their aspirations, fears and motivations (Guénin-Paracini et al., 2014). In this regard, an audit firm attempts to realise its goals by encouraging employees to view the use of BDA as something that could enable them to meet and overcome their personal and professional aspirations and fears (see Section 3.2 of Chapter 3). More specifically, this involves the firm’s administrators (partners, directors and managers) introducing mechanisms and pursuing purposive discourses designed to bring congruency between auditors’ aspirations and the firms’ goals with regards to the embedding of the new technology (Covaleski et al., 1998; Robson et al., 2007). However, administrators (e.g. engagement partners) are also subject to identity regulation (Covaleski et al., 1998; Anderson-Gough et al., 2001; Kornberger et al., 2011).

Theoretically, the chapter applies the construct of identity regulation developed by Alvesson and Willmott (2002), which identifies and explains a range of external forces (explicit and implicit means) which managers of an organisation deliberately use to influence employees to behave in a certain way (Anderson-Gough et al., 1998, 2001). Therefore, in this context, as discussed in Sub-section 3.2.3 of Chapter 3, identity regulation is regarded as part of audit firms’ (Anderson-Gough et al., 1998) “relentless pursuit to develop and nurture members who can internalise its goals and values, thereby rendering more effective control and performance” (Nair, 2010, p. 6).

The chapter states and discusses both the explicit and implicit means which audit firms employ to encourage the use of BDA within the audit process. The chapter argues that identity regulation is being operationalised through these means. In order to achieve this, the targets identified in Alvesson and Willmott’s (2002) identity regulation framework (employee, action orientation, social relations and scene) (see Figure 3.4) are viewed as means to reshape auditors’ identity. These are discussed in the context of an auditor, recognising Alvesson and Willmott’s (2002) assertions that the four targets are connected and can overlap with each other and that their classification above is mainly for analytical purposes.

The chapter is organised as follows: Section 6.1 introduces the auditors as the target for identity regulation and provides the rationale for identity regulation, which is to “win the
hearts and minds” of auditors through implied and prescriptive means. Section 6.2 presents the means through which auditors are encouraged to use BDA in audits of financial statements. Finally, Section 6.3 provides a summary.

6.1 Encouraging the use of BDA in audits of financial statements

As indicated in preceding chapters, audit firms have a history of developing and implementing different audit approaches to respond to the regulatory landscape and the economics of auditing. In developing such approaches, firms also attempt to change audit practices and redefine the roles of auditors at a particular time and space. For instance, the development of BRA was designed to give auditors an opportunity to change practices by re-shifting the focus from transactional balances in the financial statements to understanding the strategy of the client. This approach then required a redefinition of the auditor’s role with autonomy being advocated for how auditors could determine the nature and sufficiency of audit evidence based on their understanding of the client’s business and strategic processes (Curtis and Turley, 2007). Audit firms assumed that the change in their role to include more auditor autonomy would resonate with desired auditor attributes such as professional judgements and scepticism.

However, in an attempt to redefine their roles, auditors also reconcile the new roles with existing roles, which could affect the way auditors see themselves as professionals and members of an audit firm. This implies that changes in the roles of auditors could influence their sense of identity. Sometimes ambivalence exists because a liminal space is created, since auditors harbour multiple identities derived from performing multiple roles (Gotsi et al., 2010). Here, administrators in audit firms define roles and create scripts (computer programmes) which are embedded in the organisational structure and technologies to help auditors overcome this ambiguity. This study advances the view that any change in technology has implications for the way auditors like to be perceived (external image) and the way they see themselves (self-concept). Such re-identification of auditors associated with audit technologies is made possible in audit firms because, as re-inventive institutions (Scott, 2010), they provide resources and locales where the identity of auditors can be either
questioned or reshaped (Cooper and Robson, 2006). In audit firms, the conceptualisation of being a professional auditor is negotiated through various strategies (Empson, 2004) and technologies (Fischer, 1996).

This study views the introduction of BDA in a similar way to that of previous audit technologies, which have been extensively studied to understand the practice of auditing. Accordingly, this chapter demonstrates how auditors are made to think about and use the techniques and vocabularies associated with BDA, which are drawn from the field of data science. Consequently, doing so makes auditors appear relevant to the conduct of audits in data driven environments and also strengthens the promotion of BDA to clients and regulators. While it is too early to assume that auditors will soon become data scientists, their expected role is being directed towards this (to be discussed later in the chapter).

If one acknowledges that technological innovation requires reconsideration of auditors’ identities, then studies of the means through which a technology is embedded in practice should focus not only on the practical adaptations of that technology but also on the more implicit ways in which audit firms may motivate auditors to adopt the technology. The evidence collected shows that audit firms are targeting the auditor with implicit and explicit means that are linked to auditors’ identity as they use BDA in audits.

6.1.1 Targeting individual auditors

The evidence collected from the audit partners dealing with the development and implementation of BDA in audit firms confirms that analytical tools have been used in audits of financial statements for over three decades. The current analytical tools such as ACL and IDEA are not an entirely new phenomenon. Most of the interviewees provided historical accounts of how analytical tools found their way into the audit process and of the challenges associated with their use. It is clear in their accounts that auditors were reluctant to use or rely on these analytical tools in an engagement, feeling that previous analytical tools did not provide value to audits and were also expensive resources to be budgeted for in the audit process, because they were owned and managed by specialists within the firm. The evidence
shows that there has been a desire on the part of administrators of audit firms to have analytical tools used extensively in the audit process. However, previous attempts have been thwarted by auditors’ failure to identify themselves with the tools because they have perceived that no value was offered to the auditor in terms of elevating their status within the firm and providing efficiency.

The previous platforms never worked because effectively it had to rely on specialists... Because the specialists are an expensive and a finite resource... and I don’t think people really identified it as a value adding thing for their engagement. (Partner, P1)

This perceived lack of value in previous analytical tools normally related to the inability of auditors to collect a sufficient amount of the desired audit evidence. Auditors’ lack of understanding in interpreting the results of tools such as statistical sampling (Humphrey and Moizer, 1990; Turley and Cooper, 1991; Matthews, 2006) gave them limited confidence and comfort (Pentland, 1993). The interviewees acknowledged these challenges in embedding previous analytical tools. However, it could be argued there is a contrast between past efforts, in which analytics were perhaps justified as a way of reducing direct evidence collection, and the current approach, in which part of the focus is on possibilities for evaluating full populations, i.e. on expanding the audit evidence.

The participants highlighted that the use of BDA is regarded as part of the audit strategy in most firms, and hence the emphasis in the promotion of the use of BDA in the audit process is on achieving the necessary alignment between individual personal professional agendas, objectives and aspirations and those of management.

We have X strategic growth initiatives and one of them is data analytics across the firm. We are attempting to move to a common technology platform where you have a suite of solutions where everybody can spend for their service lines. (Director, D1)

There is a drive within the firm from the executive level to encourage the use of BDA in audits and, as such, most communications within the audit function highlight the importance of BDA.
A carrot and stick approach has been mentioned as being adopted in many firms. The use of a carrot represents the means of helping auditors re-evaluate and internalise their professional roles and responsibilities by relating BDA to their centrality and distinctiveness as auditors and that of their profession. This might involve administrators putting in place mechanisms that encourage auditors to use BDA voluntarily. These mechanisms are designed to make auditors feel that BDA either might address their concerns during audits or might enhance their job satisfaction. On the other hand, the use of a stick involves techniques that administrators employ to make the use of BDA in audits imperative, thereby creating an obligation among auditors. Auditors are required to make commitments to the use of BDA as part of meeting a firm’s objectives, which include addressing regulatory concerns.

Both implicit and explicit measures are based on administrators’ observations that auditors are unpredictable in responding to and internalising new audit technology. Therefore, the embedding process has to be managed effectively as the participants below indicate.

It [use of BDA] is the problem for the whole organisation. It is a problem of innovation for every organisation. We have to change the way people do things and it is not like it is linked to a machine. If this was a factory production line, the guys know the different buttons they have to press because it is there and could be the only button. In our world, it is a bunch of independent individuals in audit teams, independently going about each audit using a common methodology (emphasis added). (Partner, P3)

You just have to encourage them to do it. They are a very risk averse bunch of people; it is very difficult to get them do something different from what they did last year (emphasis added). (Director, D1)

In the interview excerpts above, two important points are very illuminating in understanding how auditors identify themselves when technologies are introduced. The expressions, “in our world” and “they (auditors) are risk averse”, indicate that in the world view of auditors, autonomy is very important and any attempt to change practices have to be carefully thought out. They also highlight how auditors define themselves in a distinct manner. This is significant
because it points to the need to appeal to the way auditors identify themselves. Therefore, it is not surprising that most administrators and managers at the practice level indicated that the approach which is being adopted to encourage the use of BDA is a combination of carrot and stick, with the former being expressed as “winning hearts and mind” of auditors both at the administrative and practice levels.

It is a much harder organisational problem to change... At the end of the day, it is a hearts and minds strategy... (for example) risk assessment is a huge carrot. (Partner, P4)

I always say to use a carrot and stick. We are trying the carrot at the moment. (Manager, M2)

Therefore, in the following sections, a discussion is provided on how administrators influence auditors to commit to and use BDA as part of their job roles during audits.

**Winning hearts and minds of the auditors**

In order to motivate auditors to use BDA, audit firm administrators make attempts to appeal to them by aligning individual firms’ agendas with regards to BDA promotion with those of their auditors, the ultimate goal being to achieve a more BDA-driven audit process. The interview evidence indicates that audit firm administrators problematise the status of auditors as an occupational group and emphasise the role that BDA can play in elevating such a status. One of the interviewees (a director of an audit firm) quoted his line manager pointing to a greater reliance on BDA as a way to improve auditors’ perceptions about their self-worth as well as the perceived value of auditing to clients.

A partner said in one of the pitches: “I am fed up with my profession being seen as less valuable every year; I would like our biggest clients to change this view so we’re once again seen as a hugely valuable service to our clients and shareholders. (Director, D1)
In a similar vein, another partner problematised the audit space as unexciting in terms of what happens within it. She referred to the boredom one can experience when doing routinised audit procedures given the amount of time one needs to qualify as an auditor.

Audit is not always the most exciting place. If you have to get to sample paid invoices, then you have to go and find 200 of these things. Then you have to check that something which has been written on a piece of paper was ok. [Compare that with] four years of getting your university degree, two years becoming a qualified accountant; it is not the most exciting thing to do. (Partner, P4)

Problematising the audit profession and space in this manner allows the administrators to bring in managerially inspired discourses that place BDA at the epicentre of elevating the status of the audit profession and making the audit space more exciting. With this focus, the interviews revealed that several programmes of change relating to the audit function and technology have been introduced in most of the Big Four firms. The programmes are given symbolic labels, such as an “audit transformation”, with a specific objective of bringing BDA into auditing. The leadership for such programmes is drawn from a diverse pool of senior partners and directors from the audit function and the firms’ other service lines. However, some participants stated that partners or directors from the audit function purposely take the lead in such programmes. This is important, because presumably it is designed to provide positive messages to the auditors and, hence, influence their willingness to engage with BDA. For instance, one partner mentioned that the objective of his firm is to bring BDA under the jurisdiction of auditors and away from specialists.

All of our clients from top to bottom have access to quality analytics regardless of their size. And in order to serve our clients better with analytics, fundamentally is to put analytics into the hands of the auditors as opposed to the specialists. (Partner, P1)

This could be seen as an attempt to overcome the challenges associated with previous developments in analytics. Since audit technologies instantiate auditor expertise (see Chapter 2), this can also be viewed as a means of establishing autonomy in determining the trajectory
of the technological change, which is important for the legitimacy of auditing. Given that administrators problematise the value of the audit profession and its status, the programmes of change mentioned above are geared towards linking the use of BDA to the widespread concerns over the value of auditing and the status of audit practitioners.

The interviewees provided two key messages that are promoted among auditors in relation to the use of BDA in audits. First, auditors are continuously given information that indicates that BDA would improve the value of audits they provide to clients because of the insights that are generated. In this regard, audits are seen as a space where auditors can obtain insights which then generate value for themselves and their clients. They argue that clients would now see them as valuable since they can identify areas for improvement. This is potentially relevant to how auditors see themselves as professionals, because it gives them autonomy to interpret the audit evidence from a plethora of sources. The ability to generate insights is portrayed as adding another dimension to the value of an auditor. Auditors are able to show that they are creative in an environment which is regarded as competitive. Being seen as creative is important for career progression (Gill, 2009; Spence and Carter, 2014) within and outside of the firm, as auditors can move from the audit function to other functions such as Risk Advisory. Therefore, ability to use BDA is also linked to the personal growth of the auditor in terms of career progression, since auditors can show that they are flexible and can multi-task. In this regard, audit firms state that skills in BDA are vital in the current environment. It could be argued that for the audit firms, having a flexible worker who can use BDA in different areas is beneficial and significant, given that firms offer multi-disciplinary services. Further, it resonates with their desire to portray auditors as business advisors (Robson et al., 2007) in a data driven environment. The excerpt below from one of the directors highlights how BDA is implicated in the identity of auditors as business advisors:

If you think of the world today, there is so much data at our clients. To be a business advisor or someone who adds value to the client, you need to understand their business and you will need to talk to them about what their business is... You need data analytics to be able to support that because the stuff you are going to add value to are things that happened in their business. But they don’t know about it or they
have not been able to see the wood for the trees. It is things that only data analytics can help them and position themselves stronger for a more valuable conversation. (Director, D3)

Second, administrators construct discourses showing that the concerns and fears of auditors could be alleviated when BDA is used in audits, given that auditors are able to make informed professional judgements based on absolute, not relative, values. Guénin-Paracini et al. (2014) observed that an audit process is an emotional exercise in which auditors are gripped with fear and anxiety in case they make mistakes or they are ignorant about something. The study also indicated that fear is cultivated, in the case of a data driven environment, with some partners problematising the audit environment as litigious. However, Guénin-Paracini et al. (2014) indicated that auditors mobilise resources that could help them overcome this fear and anxiety. The evidence suggests that administrators see the use of BDA as overcoming the challenges associated with auditors’ confidence when samples rather than full populations of transactions are used. Considering that BDA allows the analysis of all of the transactions in a population, auditors are told that they are able to form their judgements from this vantage point. Auditors are able, with certainty, to either increase or decrease subsequent work. The alleviating of fear in this context gives auditors the ability to make professional judgements confidently.

Others also suggest that BDA enables flexibility in auditors’ work and improves their work/life balance, as a consequence of being able to work remotely, which facilitates the planning and scheduling of their work around family life.

What we are finding with data analytics is we are able to move work around to earlier in the year and therefore we are having less of the crunch during busy periods. That is very appealing to our workforce, who want to have a better work/life balance. (Partner, P4)

Therefore, it can be concluded that administrators help auditors to internalise BDA by constructing managerially inspired discourses around aspirations (i.e. establishing a link
between the use of BDA and the achievement of auditors’ personal objectives), removing fears and providing hope. BDA is linked to the aspirations of auditors because it is regarded as enabling them to be creative through insights. This is linked to potential career progression within or outside the firm. In this way, what is central to the lives of auditors is targeted and appreciated by administrators. BDA is also attached to removing anxieties associated with making professional judgements based on a smaller sample. Here, BDA is regarded as the audit technology that can enhance auditors’ confidence when faced with uncertainty because it analyses all the transactions in a population. Finally, in providing aspirations and overcoming fear, BDA facilitates a change in working practices structured around balancing professional work and personal life.

The following discussion provides examples of the means which administrators use to embed BDA in audits, namely firms’ approaches to the recruitment of new audit staff, practices for training and incentivising auditors, performance evaluation and populating of the audit process with BDA tools.

6.2 Means of embedding BDA in audits

6.2.1 Recruitment

The recruitment pattern in audit firms is changing to reflect the desire to have broad based analytical skills in the audit and other functions. The interviewees stated that the success of BDA in audits depends on the skills and knowledge of people performing them. One such skill is the ability to analyse the data in a manner that adds value to the audit. Given such acknowledgement, audit firms are engaged in a recruitment drive that enables individuals with analytical expertise to be employed.

First, audit firms are recruiting many experienced data scientists to offer expertise to auditing and other areas of their businesses. For example, the interview excerpts below indicate the importance placed on recruiting sufficient numbers of data scientists and analysts for audit purposes.
We have made an acquisition of 85 data scientists and data professionals in France and they’re really focused on power utilities clients... So, they got some specific skills around marketing and pricing that is related to auditing. They have also expertise around predictive models around energy use. The specific areas which are important to audit in this sector is impairment in oil and gas. (Director, D2)

We are going to need people who are a lot more literate in using data, by which I mean they have to think in a data-based way. So, I’m not entirely sure how anybody thinks at the moment but if you have pilot data you would like to use, you need to think about data fields, data groups, databases: How can they be appended? How can they be cleared? Exactly which data field you need to put into formulae you have to be using? How can that be manipulated? (Partner, P5)

Second, firms were also found to target new recruits who demonstrate a passion for BDA. This is where audit firms rely on universities and recruitment agencies to widen the net in the search for such people. In one firm, as acknowledged by a director, a lack of emphasis on technology affected recruitment strategy, especially in the case of young graduates. Therefore, the firm had to revise its approach to place emphasis on the role of technology in the work that auditors do. On this point, BDA could be regarded as the instrument for attracting technologically savvy individuals into auditing, as well as the symbol of competitive advantage among the top audit firms.

What we have found out is that the greater your use of technology the more attractive you are. So, five years ago (2010) we converted our paper file onto soft copy. We were the last of the Big Four to do that as we felt that it had an impact on how we recruit people. Other Big Four have advanced in technology, which was an issue in the graduate recruitment market. We have traditionally been the worst at marketing ourselves. (Director, D1)

In a different firm, a director expressed excitement at how his team of data specialists has grown ten times to offer services to the audit practice on a full time basis.
Ten years ago, we didn’t have data analytics specialists in audit; now we have a team of 80 people, who are delivering data analytics to audit full time and that team has now grown in the last three years by tenfold. (Director, D3)

The strategy around recruitment differs among firms. Some recruit all candidates under one umbrella of technology. After joining the firms, the candidates are placed in either the audit function or the data intensive function, depending on how they perform in the initial data analytics training. Other firms specifically state that, while candidates are being recruited for the audit function, their ability to use technology is an important asset that differentiates them from the rest. Most firms, however, have designated times when candidates are assessed and selected. One participant explained that his firm uses these assessment days to identify the technologically savvy candidates that want to join the audit function. He went on to say that candidates are told that they would be part of the audit for the future, in which technology plays a crucial role. Further, in some tasks performed during the assessments, such as case studies and group presentations, candidates are provided with spreadsheets to identify unusual patterns or anomalies. See the interview excerpt below.

We have put technology right at the centre of [the recruitment process]. Some of the case studies, group exercises are based on technology or analysing data. It doesn’t matter whether they got a science background or not... If they can look at a spreadsheet of data and are able to pick up unusual items, talk about them, that’s the sort of person who would be a good auditor of the future because they can spot patterns and analyse data etc.... What the auditor needs to know is to spot the needle in a haystack and they can use technology to help them do that. (Director, D1)

The purpose of the above exercise, therefore, is to evaluate the candidates’ analytical capabilities. It was noted that while young graduates are required to show technical competence in analytical tools such as Excel to be considered for roles in auditing, experienced auditors are being recruited on the basis of their knowledge about, or at least awareness of, BDA as part of the audit process.
While knowledge in accounting is regarded as essential, it was emphasised in the interviews that audit firms are now looking for people with BDA skills, such as collecting, cleaning and manipulating data. This puts candidates with a qualification in accountancy, but who fail to show an interest in using technology, at a disadvantage in some cases. Further, for one firm, an interview participant indicated that there has been an increase in recruitment of students with STEM (science, technology, engineering and mathematics) subjects from 20% to 35% in the last two years. This could suggest a shift towards more mathematical and analytical type competencies being required of a modern auditor. This includes working with advanced computational formulae in statistics and data science. Therefore, the candidates with an understanding of computer packages, such as advanced Excel and SPSS (Statistical Package for Social Sciences), and computer languages, such as SQL (Structured Query Language) and Python, are given priority. Candidates who can demonstrate better analytical skills are often prioritised. For example, one auditor described how her non-accounting academic background was considered to be an advantage for understanding BDA.

I did history... history and analytics are related because history is very analytical. You need to have a level-minded brain to do analysis quite similar to analytics. I don’t find it difficult to adapt, but I understand some people do [struggle] from different [academic] backgrounds. Such people are asked to do other areas because an audit firm is a big organisation and you always have jobs... My take is that you can train someone the technical side but you can’t train them to think analytically or logically. Maybe you train someone to think logically but at the age of 28 it’s probably too late.

(Auditor, A1)

6.2.2 Embedding BDA through practices regarding training, career progression and personal incentives

The interviewees stated that the amount of support being given to auditors has increased since BDA started becoming a common feature in audits. As discussed above, new roles at partner and managerial levels have been created at the top of the hierarchies of audit firms.
Most of these partners have a background in auditing which could act as a positive message to the junior auditors about the relevance of BDA to auditing. This is essential because what is central to the lives of auditors could be viewed in terms of aspirations to be an audit partner with BDA experience. There is a hierarchical positioning of auditors in BDA designated partner roles in audit firm leadership teams that have given BDA its prominence (see Figure 6.1).

Figure 6.1  BDA-inspired roles in audit (http://www.ey.com/uk/en/services/specialty-services/big-data)

![Image of team members](http://www.ey.com/uk/en/services/specialty-services/big-data)

Meet the team

Hermin Heyns  
Partner, UK&I Data Analytics Lead  
Fraud, Investigation & Dispute Services  
LinkedIn

Eoin O’Reilly  
Ireland Data Analytics Lead  
LinkedIn

Gareth James  
Audit Analytics Partner  
Assurance  
LinkedIn

Ben Taylor  
Innovation Partner  
Assurance  
LinkedIn

The populating of BDA-inspired strategic roles, among other things, is designed to demonstrate the tone at the top about the direction of BDA-related developments within the hierarchies of firms. Further, individuals at the executive level with BDA-focused roles are the ones that usually play key roles in promoting the technology within their firms. In this regard, BDA is relied upon as a means for these individuals to differentiate themselves and pursue their personal career aspirations, and in the process of doing so, further advance the BDA-focused agendas of their firms. Some firms, for example, have created knowledge repositories on BDA, which include a pool of senior members of staff (partners and managers). These knowledge repositories act as buffers from which practising auditors draw information to inform the delivery of the audit and resolve the challenges of everyday practice. In some firms, these services are offered at no extra cost, hence offering an additional incentive for auditors to access BDA-related knowledge resources more regularly.
Training programmes with a particular focus on BDA are another example of the methods of promoting the use of this technology within audit firms. The training can either be online or in the form of sessions away from firm premises, the latter being either summer or winter training programmes designed to bring auditors from different branches/offices together in one place.

We’ve been running a lot of capacity-building competence with data analytics courses over the last year, and we will run them again this year. (Partner, P3)

One participant indicated that in one firm, structured training is provided to help auditors with interpreting results of BDA output and to also assist in showcasing how BDA fits into audit methodology. The aim is to encourage auditors to appreciate the relevance of BDA in the audit process. There is also technical training on the use of BDA tools. This training differs from firm to firm. In some firms, the nature of training depends on the level of seniority or length of service. While this is not common, in other firms experienced staff are retrained to acquire skills in computer languages such as SQL.

I think I might go on a SQL course on a personal level. I think the skills requirement will change. We will require at some point the actual mechanical SQL style skills to increase, as well as thinking on a data style way. What will also happen is the increase in analytical skills in terms of understanding the actual results and its implications. I think there is going to be a shift in skill base as we have seen in the past. (Director, D1)

For less experienced or new entrants, the focus of the training seems to be on encouraging them to become data analysts.

The issue for me is: Do auditors actually appreciate how they can use analytics? Thus, are they able to develop an audit approach that integrates analytics? That is the thing you have to overcome. (Partner, P1)
We find that anybody under a certain age is quite good with Excel but others are patchy. So, we make people get on to Excel and IDEA... That makes them start thinking about data structures and data manipulation. That gives you the break or the right way of thinking and a broad framework which can end up giving you different solutions. (Director, D1)

We got a training programme now where every new joiner not only does their accountancy training; they do a course in how to use analytics and excel toolbar. Those guys are only in their third year with the firm and are not running jobs. So, the skills throughout the whole organisation if you like... are in the junior team, not with the guys who set the direction of the audit, and it is a topic we have identified. (Partner, P3)

In terms of the time which audit firms dedicate to training their staff on BDA tools, participants from two firms stated that auditors are given intensive training on BDA tools of between one and two weeks. This is complemented with on the job coaching on how to use BDA in specific live areas of the audit. An auditor from one firm in particular stated that auditors who have completed the intensive course are assigned to a function that has intensive data analytics projects, such as data assurance or risk advice, in which the use of BDA tools is more common place. They are then transferred back to the audit to encourage others to use BDA. See the interview excerpt below.

They are given tools-specific training, so if they are going to use the tools like Alteryx or they are going to use a SQL-based tool, they will have training in those tools. You would put people probably in a two week intensive course in terms of how to use analytical tools, and we have a week’s methodology course..., pull them back into a specialist team for the year and they just deliver data analytics day in, day out and then go back to audit... By using it regularly you create a real core knowledge of how to do data analytics. (Director, D3)
In order to minimise potential resistance from auditors, BDA’s operational functions are designed with less complexity in appearance so that they can be operated by experienced auditors with fewer skills. In many cases, the BDA interface looks like Excel. This is used to make sure that auditors are interacting with a platform that is not technically superior, but one they are familiar with.

There is a separate database sitting underneath this, so all Excel is doing is actually displaying the information, is sending a command to the database while the processing is taking place and then the information is being shown in Excel. And the reason we use Excel is because everybody is familiar with Excel and they are comfortable using it. A new tool is actually in a different software we are buying in; it’s a little more complicated and you need therefore to train people as to how to use it. With Excel you don’t need to train people as people learn Excel at school; people get trained in Excel, so it makes adoption easier when you got software that people are familiar with. (Partner, P2)

It was observed that BDA platforms, and Lavastorm© in particular, show workflows on the dashboard to enhance the appreciation of BDA because of its transparency as well as the user-friendliness of its interface. As noted above, BDA operations were perceived as ‘black box’ in nature because of the way the algorithms’ work cannot be seen. It could be argued that the introduction of packages like Lavastorm© are meant to open that black box and make the audit process more transparent, and this is acknowledged by firms. They indicate that this gives the auditor confidence, as seen in the interview excerpt below.

So, over the years, we have developed IT auditors and their role is purely to look at that black box, but again, you now know how to understand what’s happening when you’ve got millions of transactions taking place. Now, you know as an auditor how that’s all happening. This gives us that view into that black box we never had before. (Partner, P4)
Interviewees at partner and director levels insist that the guidance is one mechanism to help auditors make informed judgements about areas that are very important, such as risk assessment. They argue that BDA in no way replaces auditors’ ability to make their own professional judgements. In one firm, they have developed interpretive schemes such as decision trees, which have to be followed to derive a decision. Prior studies (Fischer, 1986; Curtis and Turley, 2007) have shown that adopting such a structured approach as this has resulted in auditors being unwilling to use the tools as they feel that their professional judgement, which guarantees their autonomy, is jeopardised.

As a firm, our guidance on how to audit comes from our owners of the governance of the methodology. They issue actual guidance to auditors and say if you do this and follow this decision tree, use analytics here, use analytics there, use other procedures there. But this is the decision tree to follow and you can get to that conclusion: do a little more or do nothing. (Partner, P3)

Developing interpretive frameworks such as decision trees could be viewed as a means of regulating auditors’ identity and promoting structured audits. Such frameworks are accompanied with support from other experts within the firm, such as data analysts and IT auditors, who are mandated to help auditors when they are having difficulties in using BDA. This could be seen as audit firms providing auditors with the relevant vocabularies associated with BDA as well as mitigating their lack of skills.

Therefore, through explicit means of recruitment and training, auditors are encouraged to embrace not only changes in audit practices (how to use BDA and how it is affecting their role) but also a “vocabulary of motives” (why they are using it), so that the value of BDA can be appreciated (Alvesson and Willmott, 2002; Empson, 2004). In this regard, apart from a vocabulary of motives, discursive practices around capacity building include provision of knowledge and skills. This defines the role of an auditor in a data driven environment, especially when BDA is linked to audit methodology motives, according to which auditors are told that, by analysing all transactions in a population, BDA can enhance the quality of audit evidence, which can offer valuable insights and provide efficiency in audits.
6.2.3 Embedding BDA-related rationales into systems of incentives and performance evaluation

Variation in skills and in uptake of BDA between experienced auditors and new recruits is anticipated, given that BDA was not part of the accountancy training which experienced auditors went through. Therefore, some firms have embarked on implicit means that encourage auditors to use BDA, in which the vocabulary of motives is highlighted, and knowledge and skills are showcased. As expected, in many firms, there are some auditors who have more appetite for BDA than others. Some firms also rely on such auditors to help them carry the message of BDA to others who are still reluctant to use the technology. One firm, for example, publishes and circulates names of those auditors who are doing well with BDA in internal communications such as emails and magazines. Information about these individuals is also carried in videos and podcasts about BDA. The aim is to make them visible at the firm level to inspire others to use BDA.

Further, they are also invited to talk about their experiences with BDA at management committee meetings. One participant argues that this gives the individuals job satisfaction and access to opportunities that come along with it. For instance, they are assigned to teams to win tenders for clients that use BDA. See the excerpt below.

They are offered the best opportunities in terms of career progression and job satisfaction. In case there is a new audit tender coming up and we know that BDA will play a big part in the audit tender because it is a real differentiator against our competitors, then we want someone who has done it before in one of their clients to come on the tender and try to win it. That is a great opportunity to people. (Director, D3)

Another form of incentive is the opportunity for auditors to be seconded to other functions within the firm that are BDA intensive. Given that the use of BDA is attached to career progression, some auditors see this approach as a recognition of their ability to work flexibly within the organisation and this can also open doors to career progression within and outside the firm. Although administrators try to elevate the status of auditing, within many large firms
functions such as risk advice are still regarded as a step above the audit function. Those working in such functions are said to be given priority in working on challenging projects which might be an important selling point for career progression.

We [Data/Risk Assurance] take people out of each area and put them out on secondment. Some of them will move here permanently; some of them will go back into the audit. The plan with that is they will roll them back into audit because they have been data groomed. So, they know our procedures for doing things and they understand our way of doing things. They have got a lot of knowledge; they encourage their friends (emphasis added). (Manager, M2)

The idea is: over time, our advisory people will go up to the next level and will lose interest at the bottom. The stuff at the bottom, the advisory group will feed them into the data group who will industrialise it. One of their [advisory people] roles is to train the audit function, so they are up to speed with analytics. They will do that for a while until auditors are able to use analytics. (Partner, P5)

The use of the term “data groomed” by one of the interviewees depicts the direction which audit firms are taking in making auditors technologically savvy in the data driven environment.

Other implicit means include offering high street vouchers to those that have been randomly selected in a raffle draw as BDA “champions”. BDA champions, among other things, have to demonstrate areas where they have either continuously or innovatively used BDA. The aim is to share their experiences as part of best practice in BDA across the firm. One director felt that his relevance is enhanced if he justifies the use of BDA with a practical example demonstrated by a BDA “champion”. In the excerpt below, he expressed the conversation he normally has with other auditors who are reluctant to use BDA because they cannot see the value to their audits.
You have got credibility and credentials when you go to audit teams and say: “Right, why do we not use more data analytics tools then?” [And you get asked:] “What is the value?” [but reply that:] “I can tell you what the value is; here it is.” But go to speak to someone who has done it and you can get confidence in what’s being done and it’s been there, done that etc. That really helped in encouraging people. (Director, D3)

Another means of embedding BDA is by evaluating the performance of auditors and building this into the reward system. In some firms, it depends on the auditors at all levels achieving specific tasks in three important areas, namely audit quality, leadership and technology innovation. Although these may appear to be distinct, they are very much connected; for instance, the use of BDA could help the demonstration of audit quality. Similarly, the help one offers to others on the use of BDA could demonstrate leadership. Therefore, the use of BDA features highly in the evaluation of one’s performance. This includes the conducting of personal reviews in the form of audit quality and performance reviews. Both are explicit means that target those already working with audit firms to demonstrate commitment to using BDA. Both also contribute to one’s career progression and increases in salaries and bonuses. See the excerpt below from one of the participants, who was promoted from manager to director based on his engagement with BDA.

As a manager, I was involved building up the capability of the data analytics specialists and to support the rolling out of data analytics to audit practice. It is principally what got me promoted to director. Analytics was critical in the promotion, and so the role I am doing was created partly for me [because] I built the team up to such a degree that it warranted having a new [strategic role]. (Director, D3)

Therefore, performance reviews are concerned with the overall conduct and management of audits. This could include efficiently utilising the resources at auditors’ disposal within the budget and also the retention of audit clients, while audit quality reviews relate to adherence to regulators’ requirements regarding audit quality indicators. They also involve auditors committing to continuous professional development in audit quality.
In audit quality reviews, auditors are monitored for their engagement with managerially inspired messages on BDA. In one firm, this involves mandatory listening to podcasts and viewing of webinars on BDA once every month. Both the podcasts and webinars are intended to show developments in auditing standards and regulations, and good practice. This may involve highlighting areas that have been identified in audit inspection reports to also act as opportunities to provide feedback on these areas of concern. The partner from this firm emphasised that the aim of using podcasts is to provide a repetitive relay of messages about BDA. This is a typical approach in identity regulation, in which members of an organisation are exposed to similar organisational messages or images for a long period of time.

All the auditors are required to listen to it, it is podcast. It is part of our compliance obligation. We track to make sure that everybody is listening to it and if they don’t, then lots of sanctions start to kick in. We now have a permanent slot on that, maybe five minutes or ten minutes, because the whole thing is about an hour, on a topic of analytics each month. That’s again us responding, through repetition of messages, making it available, making it easy as possible and we continue to invest in that area.

(Partner, P1)

Besides podcasts and webinars, firms also subject auditors, especially partners and managers, to audit quality reviews. It was indicated that audit quality inspection reports from regulators such as FRC have an influence on how BDA is used to overcome audit quality deficiencies. This regulatory concern about audit quality is being used as an opportunity in some firms to mandate the use of BDA in certain areas, such as identification and assessment of fraud risk factors (ISA 240). In this case, the use of BDA is compulsory, especially in areas such as revenue recognition and provisions. Auditors are told that assessing fraud risk factors cannot be achieved without BDA. At audit quality reviews, auditors are required to explain and justify why they used, or have not used, BDA in such areas.

At the end of the day, it is hearts and minds strategy. We have not made it a stick, the only place it is a stick is what is called journal entry testing for fraudulent financial reporting and misappropriation of assets, thus ISA 240, PCAOB AU316. It is in the
standards and you can’t do without analytics. That’s the one that is mandated. (Partner, P1)

These standards talk about evaluating fraudulent financial reporting. They specifically talk about characteristics of journals being indicators of fraud. If you take guidelines and say they are not guidelines but actual things you should be doing, the only way it can be done is through analytics. Most of our peer organisations and ourselves would mandate, unless you justify why you don’t use analytics to support that particular piece of an audit. That’s mandatory; everything else in some regard is optional. The regulations don’t call for it. (Director, D2)

For performance reviews, some interviewees stated that the use of BDA is now incorporated into the reviews of partners. Given that there is variation in how BDA is used across offices within a firm, some participants noted that having a “stick” approach at governance level is the way forward in achieving congruence in usage across offices.

In terms of our promotion criteria, we assess people in terms of a number of things, quality being number one. Leadership – we look at people development and we look at their technology innovating. We expect people to have rounded skills sets across all those. Director, D3)

Therefore, performance reviews in some audit firms require the demonstration of BDA usage in audits at an office level. In other firms, the inclusion of BDA in performance reviews is driven by engagement partners. Thus, partners express their desire as part of performance review objectives to try and use BDA in audits. This is also acknowledged by the individual’s line manager, as in this quote:

I have had two people this week coming to my desk and they said the partner has said we must use data analytics on revenue; we must use data analytics on stock. That’s the way we’ve got to audit it and we want to see what we can do and that’s really positive. (Manager, M1)
6.2.4 Embedding BDA through automating (industrialising) BDA-focused audit procedures

Industralising BDA involves making BDA tools widespread in many areas of audit procedures. Therefore, it is clear from the interviews that audit firms have put together suites of BDA capabilities that can be easily accessed by auditors and staff from other functions. Given that different forms of analytics are developed frequently, audit firms have embarked on strategies that bring analytical tools under one umbrella. However, in order for auditors to appreciate the relevance of the technology in the audit firm context, the rationales of efficiency and effectiveness are being gradually introduced to promote its use. The evidence states that firms problematise the current audit technologies, such as statistical sampling, to demonstrate that BDA could improve the collection of audit evidence and the outcomes of audits. For instance, some partners indicate that the economies of scale gained by using BDA are far greater than by using existing methods such as statistical sampling. Therefore, firms are encouraging auditors to appreciate the benefits of BDA on this basis.

The principle objective of this platform is to deliver analytics in a cost effective way into all of our audits without consideration of the ability of the audit to pay. All of our clients from top to bottom will have access to quality analytics regardless of their size.

(Partner, P1)

The rationale of efficiency is based on offering cost effective audits. This relates to the economics of auditing, which requires auditors to manage their costs in a manner that audits create value for the firm. Given that the literature (see, for example, Robson et al., 2007) has shown that the current market for audits is competitive and stable in terms of the fees being charged, BDA provides an opportunity to instantiate the efficiency of audits in a data driven world. At the moment, most audits are up for tendering; hence, firms use BDA to showcase their ability to offer audits in a cost effective way. As noted in one firm, a big client approached them to demonstrate how BDA can be used on client data. The client used these demonstrations to identify potential suitors.
In some firms, BDA tools are developed in other functions such as risk advice or data assurance and are then fed into the audit function if they are applicable. This approach also works vice versa with BDA developed in audits being used elsewhere within the firm. Such pooling of BDA analytics together also provides a cost effective way of developing and applying BDA tools across the firm. Sometimes the BDA tools are embedded in the firm’s proprietary BDA platform so that auditors can relate BDA to the firms’ objectives.

The [Spotlight] programme pulls all analytics together under one umbrella but inevitably, as we have been around for a long time, there are hundreds of analytical tools people have built for industry specific things and also in different countries. … Within our firms, we have 1,000 different implementations of analytics across the world, which are put on people’s [auditors’] desktops. (Partner, P1)

Since BDA tools are developed using computer languages that are not synonymous with auditing, some audit firms present these tools in a more user-friendly way that auditors can relate to. In this regard, BDA tools are sometimes placed conveniently so that auditors can easily access them, such as on the Excel toolbar. Further, the BDA tools are given names that relate to terminologies in auditing to describe what BDA can do. This interview excerpt summarises this process.

Since everyone has Excel, we have just put add-ons for analytics and give them specific audit-relevant capabilities such as “sample it”, “compare it” “re-age it””. (Partner, P1)

The provision of audit friendly terms, like “sample it” for selecting the transactions and “re-age it” for circularising receivables, acts as a reminder for auditors because they can relate these to their work.

We came up with a suite of analytics that we directly link to our audit work and designed those in a separate environment using that terminology, so hoping very senior audit partners are SAP aware. And then we looked through them and said:
“Let’s categorise them as to automated”, as in whether they give a deterministic, a clear judgment as a result of doing analytics. (Partner, P5)

The participants argue that the role of industrialising BDA is to make it more accessible to the auditors without wanting to request assistance from the data analysts. This approach links BDA use to enhancing auditors’ autonomy. This does not mean that, at the moment, auditors are fully capable of operating BDA tools independently.

6.3 Summary

In this chapter, the way in which audit firms encourage auditors to use BDA in the audit process and function has been discussed. Considering that previous studies have viewed technological change mainly as a process requiring the revisiting of auditors’ practical approaches and have attended to the means of achieving that, this study has added another dimension which has been largely ignored. Specifically, it develops the premise that technological changes in auditing also require the reconsideration of the professional role and responsibilities (identity) of auditors. Therefore, drawing on the literature on identity regulation (Alvesson and Willmott, 2002; Empson, 2004), the study has explored how the regulation of auditor identity is used as a means of encouraging the use of BDA. On that basis, the chapter has drawn on Alvesson and Wilmott’s (2002) construct of identity regulation to identify the explicit and implicit means of organisational control which are employed by audit firms’ administrators to manage the aspirations, fears and motivations of auditors. The aim for such means of control is to simultaneously achieve organisational goals and auditors’ professional and personal goals.

The chapter therefore finds that audit firm administrators target auditors at all levels of both the organisational hierarchy and the audit process to regulate their identity. The process of identity regulation involves administrators employing managerially inspired discourses which problematise auditors’ roles in the data driven environment in order to situate BDA as the panacea for addressing issues such as auditor status, audit efficiency and efficacy. In appealing to the status and efficacy of auditing, BDA is portrayed as enabling auditors to
derive quality audit judgements, as well as enabling them to be seen as creative and innovative through the discovery of insights from BDA. In relation to the efficiency of auditing, BDA is presented as a cost effective tool for offering quality audits to clients and as a means of having a competitive advantage during the tendering process.

Means such as recruitment of new auditors, training, career progression, incentives, performance evaluation and industrialisation of BDA tools are used to manage the “insides” of audits and also to obtain commitment from the auditors. This is structured in such a way that a balance is provided between enabling the provision of structured audits, which can be vouched for in terms of regulatory and litigation purposes, and the ability of auditors to exercise autonomy in their professional judgements.

These explicit and implicit means are instantiated through practices which define the auditor, offer them a vocabulary of motives, provide them with knowledge and skills, designate some individuals in audit firm hierarchies with BDA-inspired titles and, finally, define the rules which auditors have to follow when using BDA. The chapter also argues that these practices are designed to mold auditors into an identity which makes them feel relevant in performing audits in a data driven world. The underlying objective is for firms to provide audits to clients which address regulatory concerns and to make themselves competitive as businesses.
CHAPTER 7: PROPERTIES OF BDA AND RECONFIGURATION OF THE AUDIT PROCESS

The previous chapters have provided evidence on the way BDA is promoted outside and within audit firms. Chapter 5 focused on rhetorical strategies which firms use to show that BDA assists in providing quality audits and in adding value through insights for clients. Chapter 6 continued with the same line of inquiry but changed course by exploring the means through which the use of BDA is encouraged within firms by persuading auditors to reflect on their organisational and professional identities within a data driven environment. Firms can be seen as regulating auditors’ identity as part of the process of making sure that the use of BDA is embedded within the audit function.

Both chapters 5 and 6 rely on the significance of discursive practices to explore how BDA is promoted and encouraged outside and within the audit firm. In this chapter, the focus is on the properties of BDA as a technology and the implications for auditing. Prior studies on innovations in auditing have indicated that new technologies are influenced by external forces in the audit context (Robson et al., 2007). Therefore, the auditors’ role is to either apply the technology in the audit process (Curtis and Turley, 2007) or adapt to the technology (Dowling and Leech, 2014).

In this case, the research has demonstrated how auditors use technology (Fischer, 1996) to respond to external demands. Studies have paid attention to auditors in their acceptance or rejection of the technology. For example, Fischer (1996) noted that auditor inability to realise the perceived benefits of technology has resulted in it being rejected. The limitation of studies like Fischer’s (1996) is the lack of focus on how the technology influences its users by assuming that it is auditors’ own capabilities and interests that influence the adoption of the technology. Thus, these studies have not explicitly considered how specific properties of the technology might influence its adoption. This chapter, therefore, attempts to overcome this limitation by attending to the properties of BDA using the notion of affordance from the sociomateriality theoretical lens to understand the properties of BDA that enable/restrict changes in audit practices.
The notion of affordance (Hutchby, 2001; Leonardi, 2013) is used in this study because it allows the researcher to identify and explain the properties of BDA, in particular how these properties allow auditors to conduct an engagement, as well as to identify the limitations which they place on auditors in carrying out their work. These possibilities and constraints also have implications for how the audit function relates to other functions within audit firms and to their clients. This provides an opportunity to explore the interplay between the social (auditors) and material (BDA) in the BD environment. This study recognises that the audit process is a sociomaterial endeavour in which auditors and audit technology constitute the practice of auditing. In order to capture the influence of BDA, the concept of its materiality (as discussed in Section 3.3) allows us to explore specific BDA properties (actual and perceived) in the audit process.

Further, in this study two concepts are used to investigate affordances and their implications (see Sub-section 3.3.1), namely reconfiguration and relationality (Wagner et al., 2011). Reconfiguration is used to explain changes in the audit process by examining the possibilities for action which BDA properties bring to auditors. Relationality is used to show that the interaction between auditors and BDA brings together different functions within audit firms. It also uncovers the relationships which are being developed or created within the firm as a result of auditors using BDA. Wagner et al. (2011) note that technologies either bring together or set apart different functions within organisations. This could be relevant for this study when auditors’ expertise on BDA is limited so that they may rely on other professions (data analysts) to deliver audits in practice. However, reconfiguration and relationality are not stand alone concepts; they can overlap each other (see Figure 3.4). For example, the use of a shared service centre could be an effect of BDA affordances highlighting both reconfiguration and relationality.

This chapter, therefore, provides evidence on the properties (actual and perceived) of BDA, on how those properties contribute to changes in the conduct of audits and on their implications for the practice of auditing. Therefore, the chapter is structured as follows. Section 7.1 examines the configurational role of BDA as auditors try to address the long
standing problem of inference, and considers operational scope and depth as affordances which are achieved through BDA’s properties of scripts and visualisation tools. Section 7.2 then discusses the implications of the interplay between auditors and BDA within audit firms, including the relations that develop between data and audit functions, to construct BDA expertise and the challenges that this gives rise to. Section 7.3 summarises and concludes the chapter.

7.1 Reconfiguration: contextualising BDA through the extract, transform, load process

The participants stated that BDA is normally a suite of tools that offer various analytical capabilities depending on the task at hand. As such, BDA should be viewed as an umbrella term that captures the multiplicity of functions involving data analysis. Interviewees indicate that BDA is able to collect and process large amounts of data which can be used as audit evidence. In this case, they make reference to the ability to collect data from various sources in the client’s ERPs and also to the capability of analysing every transaction in a population. This is an affordance of BDA, which allows auditors a wider scope in data collection and analysis (Leonardi, 2013).

This affordance could influence auditors’ confidence regarding the sufficiency and appropriateness of the evidence they collect in order to form their opinions. Given that auditors do not collect and process all of the client’s transactions, the question of how much audit evidence is required in a given audit engagement becomes an important one when there is a change in audit methodology or technology (Power, 1997; Curtis and Turley, 2007). Auditors are required to collect evidence that confirms the assertions which the client has made in the financial statements and this is a major challenge for audits, especially when issues of audit quality are highlighted in many audit inspection reports. For instance, FRC requires that audits of listed companies provide evidence of their assessment of material fraud risk factors and of their evaluation of their internal controls for the risk of management override. Audit firms have been struggling to meet such requirements, in particular the assessment of fraud risk factors as per ISA 240 (FRC 2014, 2016). Given that firms tend to struggle with the audit evidence pertaining to the consideration of fraud risk factors (ISA 240)
and the assessment of internal controls (ISA 315) that would be deemed sufficient and appropriate (Power, 2013), they indicate that the introduction of BDA is giving them an opportunity to address the challenges associated with the shortcomings of audit evidence in those areas (fraud risks and internal control).

As noted in Chapter 5, some firms have proprietary names to describe their collections of BDA tools. It was revealed in the interviews that, before auditors get hold of the analysed data, there is a process which follows a specific model referred to as extract, transform, load (ETL). See the following excerpt from an interview that summarised the ETL process.

For each piece of data analytics, there is a process [...] that extracts the data from the client system, [that,] once you have that data, [...] transforms that [...] into a common data model that [...] loads [it] into a tool [which is going] to run a number of routines that have been set up by the audit team. The output of that tool is the data analytics and that’s what the audit team will get (emphasis added). (Director, D3)

The significance of ETL in this context is that it provides an understanding of how BDA facilitates the way data is collected and processed within the audit process. It also shows the role data analysts play and how this role is linked to that of the auditors in the audit process (see Figure 7.1).
The first stage of ETL involves the extraction of data from the client’s ERP systems. The data could be stored in either the client’s proprietary or third-party data warehouses, with the latter utilising cloud computing capabilities. The participants indicate that when there is an audit engagement, this process starts with auditors approaching the data analysts within the audit team or the data function within the firm, such as data assurance or risk advisory services. The auditor requests specific types of information from the client that could be used as audit evidence. This is based on the nature of the client, the audit objectives and the nature of data to be collected to confirm the assertions in the financial statements. Auditors also decide on the audit procedures to be performed on these assertions. While there are variations in how auditors communicate with data analysts, their role (data analysts) is clear in both the collection and processing of data, the purpose of which is to gather audit evidence to be the basis for forming an opinion. To understand auditors’ needs in terms of the data required and the audit tests to be performed, other firms have a standard questionnaire which data analysts send to auditors for completion. This outlines the audit objectives for each assertion and related audit tests and procedures. It also requires auditors to state the
nature of data they need for such procedures to be completed. At this stage, the extracted data is usually in different file formats.

The second stage, “transform”, involves the data that has been extracted from different databases and sources being collected into a single format, or similar formats, so that relationships can be derived. This involves transforming that data in a common data model. The transformation should be seen as a way of making sure that the data is related in some way. Data analysts normally use scripts to convert the data into file formats that would allow specific audit routines and procedures to be performed. The third stage, “load”, is when the transformed data is processed in the audit firm’s proprietary BDA tool, in which different automated audit procedures are performed. At this stage, visualisation tools are also used to help in analysing the large amounts of data being processed. Other firms use bespoke visualisation tools such as Powerview®, Qlik®, Lavastorm® and Spotfire® (ICAEW, 2016) which, in this study, are identified in Chapter 5. The data analysts run the scripts on the client systems and produce a report that is given to the auditors for further action.

The following sections will discuss the ETL process in more detail by making reference to the properties of BDA in order to understand how they enable auditors to collect and process data.

### 7.1.1 Operational scope with 100% of transactional processing

The use of the computer language, Structured Query Language (SQL), and scripts allows extraction of large amounts of data in the audit process, thereby widening the scope from which auditors can draw audit evidence. In this case, the properties of BDA afford auditors widened operational scope through the multiplicity of sources and the wider coverage of transactions. The issue of operational scope in terms of widening the potential sources of information as evidence was constantly mentioned by the interviewees as one of the flagship properties of BDA. Auditors apparently believe that BDA enables them to collect diverse information which could potentially contain insights into a particular management assertion. For example, one interviewee envisages that BDA enables them to access information about
the current prices of, and the age of, inventory, to name two issues which could be used to analyse inventory valuation. In this case, auditors could use the information to assess whether the assumptions put forward by clients about the valuation of inventory are appropriate. BDA therefore provides affordance to auditors to assess areas of high subjectivity such as impairment, auditable by collecting data in real time, and provides qualitative information on which the auditor can base his or her professional judgement (Power, 1997).

In terms of wider coverage of transactions, auditors state that BDA gives an opportunity during audits to access a greater volume of transactions which could then be used as audit evidence. However, some made it clear that the pooling of transactions together through BDA is not regarded as audit evidence until tests are performed on the transactions and the results analysed. This means that collecting information on weather forecasts and current prices of inventory is not regarded as audit evidence, but the results of analysing it by performing different tests could be deemed as evidence.

In many cases, auditors have contrasted the technical efficacy and utility of BDA in collecting data for audit purposes with statistical sampling. Those interviewed, along with publicly available documents such as the IAASB DAWG report (2016a), indicate that when auditors use statistical sampling, the number of transactions sampled for audit tests are either 25 invoices for the said population of transactions or a pre-determined percentage based on the materiality level. Auditors argue that this technique does not give them much comfort in terms of the operationalisation of sufficient audit evidence. Since the 25 invoices selected using statistical sampling might not be representative of the transaction population (Mathews, 2006), auditors in some cases prefer their gut feeling in selecting the transactions for further processing (Humphrey and Moizer, 1990).

In this regard, administrators and practitioners view BDA as addressing this problem of evidential inference because it has the ability to select all transactions in a population. See the interview excerpt below.
What I now have is the ability to see what the total potential error is in the population because I have looked at it all. But I don’t know how much of that unexpected amount is error and how much is perfect value justification. So, rather than extrapolating from the small number upwards, I have to interpret for the known worst case inwards to try and assess the degree of mistake that I am dealing with. (Director, D2)

Further, since clients have different forms of ERPs, the databases which store information are formatted differently. Therefore, in the case of 25 invoices, if the client has databases which are formatted differently, the challenge is how to convert them into a format that is compatible with the audit firms’ ERPs so that the transactions can be processed for audit purposes. In this regard, some participants argue that this could be inefficient because more time is consumed when the technology available cannot access transactions in multiple formats. BDA is implicated in providing such a platform to access transactions stored in multiple formats. Thus, BDA is more appealing than statistical sampling because it has a plethora of functionalities that supersede the limitations of statistical sampling. In fact, BDA has functionalities that can perform tasks related to statistical sampling. This point is important because it relates to Wagner et al.’s (2011) observation of legacy functionalities. This is essential so that auditors can relate some functionalities in BDA to auditing. Also, auditors confirm that, despite firms problematising statistical sampling as limited in addressing some of the inferential problems, there are cases where it is used in audits especially with clients who do not have a fully developed ERP that can support the audit firm’s proprietary BDAs.

The two interview excerpts below indicate BDA’s affordance in addressing the constraints encountered with statistical sampling in evidence collection.

So, in the past we would have selected a sample of journals, probably in some sort of random way, because there is no way of doing a proper investigation. And then we would have gone to the client and said: “Can you give me these journals?” And then
you’ve gone away, looked at the journals and then perhaps gone back to the client with some follow up questions based on what you have looked at. (Manager, M2)

This is just the way we are going to do it because you get a better quality audit. You can have conversation around over time. You know there may be some efficiencies here. Interestingly, that may be efficiencies for the client as well as for us, because we are not bothering the finance people because we can get straight to the data. (Partner, P8)

Carpenter and Dirsmith (1993) indicated that statistical sampling enabled the auditor to appear more knowledgeable. The evidence suggests that this is not the case anymore, as failure to interrogate large amounts of data is making auditors feel less valuable, thereby affecting the motivation and morale of the audit team. This indicates that concerns of limited coverage also extend to concerns of limited understanding of the client, which can render the auditor less important and could affect their status in the firm.

7.1.2 Operational depth

The discussion above captures how the issue of inference (Curtis and Turley, 2007) associated with sufficient audit evidence is addressed through the use of BDA. Power (1992) states that another challenge which auditors face is how to deal with appropriate audit evidence. In his interpretation, this relates to the depth of evidence. Audit firms have indicated that BDA tools have properties that provide capabilities to address this problem as well. The evidence indicates that BDA is also implicated in changing the way audit evidence is processed and analysed, and it is said to give auditors greater processing power. The evidence suggests scripts are an important functionality in BDA in automating audit procedures and sometimes blurring the boundary between the testing of controls and substantive testing.

Scripts are commands written in computer coding languages (though they could also be regarded as computer programming) and can be used to collect and analyse data. These
scripts can be written in such a way that they can perform tasks based on the needs of auditors.

For example, Structured Query Language (SQL) is a form of script that is used to extract information from databases or data warehouses. In this regard, SQL can retrieve purchase transactions over a given period; see the interview excerpt below.

We know we can take the whole of purchase pay, process every transaction taken into our systems. We recreate how every one of those transactions move through the system, how the controls are operated and what happened… And then we can identify how many of those were subject to controls and how many weren’t? If it was a small number, not material, there is a question of how much more work you need to do. It also helps with things like, in the past, in the methodology you have to do, you have to test 25 transactions; if you are testing the entire population, that’s done for you. (Director, D1)

Normally, clients have ERP systems which contain relational databases to store large amounts of data for their business operations. These can be Microsoft SQL Server, Oracle database, MySQL. SQL is then written as a script to extract data from these databases. Basically, SQL is used for collecting data through scripts that interrogate the databases so that only meaningful data can be extracted.

Scripts are also used to perform some audit procedures, but since auditors have limited expertise in script coding, a specialist team of data analysts and IT auditors are asked to develop scripts, using high level statistical programming languages, such as Python and R, which can perform the audit tests on behalf of the auditor. These scripts can be used in conjunction with SQL to “draw on external market data such as third-party pricing sources, to re-price investments” ICAEW (2016, p. 5). The initial algorithms developed within BDA can also be changed using scripts. Auditors then have the capacity to perform and manipulate the data, as well as the audit procedures, with BDA to meet certain audit objectives. It was
observed in the interviews that most existing audit procedures involving calculations can be scripted.

BDA is therefore transformed into an audit space in which auditors generate audit evidence in multiple dimensions to form the bases for their judgements. According to other auditors the scripts perform what one interviewee termed the “ticking and bashing” of audit evidence which previously was done manually. Also, since all transactions in a population can be analysed, this increases confidence levels compared to statistical sampling.

The evidence also indicates that the use of scripts affords auditors to simultaneously perform substantive testing and testing of controls. For instance, scripts are be used to check if the amount on the invoice generated and stored in the ERP of the client has been correctly entered in relevant nominal ledgers and also whether segregation of duties has been performed on initiating and authorising the invoice. One partner expressed delight at the possibility of BDA performing both substantive testing and testing of controls, thereby acknowledging the efficiencies that can be achieved from such hybridisation. See the interview excerpt below.

Data analytics can be used to accommodate either the controls approach or the substantive approach. So, if we can get that evidence without looking at management controls and we can say to the audit committee we have done our work and we are prepared to put our name to the set of financials as representing the true and fair position of the company then we have performed the objective of the audit. (Partner, P2)

However, others are not convinced that BDA is bridging the audit procedures but is rather giving prominence to substantive testing, which could potentially lead to auditors failing to document the effectiveness of the internal control, since BDA does not fully provide evidence of how the actual controls operate. Such concerns are also shared by the regulators (FRC), who have noted that some auditors are unsatisfied with the current operation of BDA and, as
a result, they are still performing audit procedures manually to gain confidence about the nature of the audit evidence.

It seems that audit teams are cautious about getting this wrong. One of the reasons explaining why the usage data for ADA tools is unreliable is that audit teams are experimenting with the tools prior to using them to generate primary audit evidence. (FRC, 2017, p. 13)

This observation echoes Curtis and Turley’s (2007) finding that auditors who were not clear in conceptualising BRA performed procedures additional to those anticipated, resulting in over-auditing. It could therefore be argued that if BDA facilitates the performance of substantive testing in greater depth, questions may arise as to whether tests of controls are still necessary.

7.1.3 BDA’s visualisation tools affording professional judgements and the generation of insights

Another aspect of BDA properties which is regarded as significant in reconfiguring the audit process is the use of visualisation tools. As noted, these tools summarise the data that has been transformed into graphical representations. The purpose is for the auditors to only highlight those areas within the data that could be of importance to the audit process, e.g. areas of high risk. Some participants indicated that, at lower levels, Excel is used as a visualisation tool when properties such as pivot tables are also important because auditors are familiar with them.

The audit team themselves need to know... how to use Excel and pivot tables etc. They (are) able to run whatever they want in Excel. It is combining the real powerful tools with a simple interface for auditors. (Director, D3)

However, there are some complex visualisation tools that are used in some cases. Most of these tools are embedded with a real time manipulation facility to allow auditors to capture any updates in clients’ databases concerning the financial statement assertions being tested.
This facility also relies on scripts which command the extraction of information when there is an update. It is not clear if the visualisation output is adequately regarded as audit evidence. Below is an extract from a regulator’s observation.

There was no clear numeric audit trail through the retained evidence to enable the work to be reconciled to the ledgers... where the screenshots retained as evidence contained incomplete keys, meaning that the visualization could not be understood. (FRC, 2017, p. 20)

However, those interviewed acknowledge that visual presentation forms the basis for discussions with the clients. As indicated, visualisation outputs take different forms, such as graphs and pie charts, but also benefit from colour to draw attention to areas of concern with the anticipation that they will be acted upon. For example, in one audit firm, the visualisation tool flashes red in instances when the account balances are outside the normal parameters. In this case, the auditors indicated that red signified areas of concern and the flashing acts as a red flag requiring attention. While this might not appear new, auditors were convinced that this would prompt auditors and clients to act on the areas identified. Some auditors indicated that visualisation does prompt auditors to see potential audit evidence from different angles. In some cases, this is important because it could potentially change an auditor’s professional judgement, indicating a psychological impact of BDA’s visualisation tool. One partner acknowledged this as follows.

The visualisation capability places BDA above statistical sampling as means of presenting audit evidence. It is important when auditors are interacting with the clients because it helps them to show expertise on various issues. Further, visualisation enables auditors to drill down the information to a very fundamental mechanic of the audit process by showing visually the debits and credits. (Partner, P1)

For instance, visualisation in PwC’s Halo BDA tool is able to pick an individual transaction like a sales journal and drill down to the person who posted it onto the system, at what time and whether the person was authorised to perform such a task (see Figure 7.2).
Besides helping auditors to analyse large datasets of audit evidence, visualisation tools also help auditors to construct insights and structure their audit processes.

Audit firms argue that dashboards, like the one in the Halo application above, enable auditors to analyse large numbers of transactions, which helps auditors demonstrate professional scepticism in their judgements (see Figure 7.3).
Based on the visualisation on the dashboard, as in Figure 7.3, the auditor is able to focus on key areas to exercise professional judgement, which gives credence to the quality of the audit. Further, auditors and clients are able to see the building blocks for the assertions in financial statements, demonstrating transparency in the audit process. This provides more evidence for evaluating how the risk assessments are conducted.

This is essentially a map that’s telling us, for any account balance, what are the sources of the numbers that are coming into that account balance, and therefore helping us really identify where are the risks within that account balance...; this is all about looking at the client’s data in 100% of the transactions taking place in a year and starting to investigate and look to see what’s unusual here. (Director, D1)

Since some visualisation tools are interactive they give auditors the opportunity to manipulate the data visually and sometimes in real time. As auditors are able to drill down the transactions which have been collected using the scripts, interviewees indicate that this gives auditors a greater understanding of the entity’s business environment. Visualisation tools facilitate the assessment of risks and also the quantification of inherent risks, because outliers can be made visually apparent for the auditor. At this point, visualisation tools are implicated in both the identification and construction of risks. Thus, areas which were problematic prior to BDA, such as inherent risk measurement, are now made calculable and become auditable (Power, 1996).

Before we used to do risk assessment, we used to assess whether our inherent risk is significant or not. Now we can start measuring inherent risk using data analytics because we can analyse more data. (Partner, P5)

The holistic view which auditors have attributed to BDA is made possible by visualisation tools.

Most of the individuals who were interviewed state that visualisation tools in BDA are a very significant feature when auditing clients in the data driven environment. In the previous
discussion, the focus was very much on the ability of BDA to process large amounts of
information. Visualisation tools within BDA could be regarded as an epistemic resource (Burri,
2008) which helps auditors understand more about the clients, thereby facilitating the claim
to expertise in BDA as well as in other areas of business (Andon et al., 2015; Power, 1992).
Coslor and Spaenjers (2016) noted that certain technologies are a necessary condition for
some forms of knowledge to emerge. Since visualisation tools in BDA enable auditors to
understand a client’s business environment and process, auditors are able to identify other
areas of the client’s business requiring attention.

They [clients] are much more comfortable to know that we are bringing that expertise
and sitting to discuss in the planning of the audit. The chief financial officer and audit
committee are both trying to protect the reputation. They are also both worried about
profits if they have been materially misstated and have to go back on to the capital
markets and say we recorded it wrongly. It is going to hit them very hard. (Director,
D2)

The areas which have been identified as requiring attention are sometimes called insights.
The provision of insights (IAASB, 2016a) is seen as another dimension of adding value for the
clients. Audit firms acknowledge that insights provide them with an opportunity to leverage
the economic benefits associated with auditing and advice. They have cited the tendering
market as the one that has triggered the use of visualisation as a means of either retaining or
gaining new clients. It could be argued that the use of visuals in auditing has several
dimensions, as noted above. One audit firm indicated how the visualisation facility helps
auditors to discuss with confidence the areas of risk associated with the client’s operations.
Not only are existing practices transformed, but new spaces for managing risk are identified
as a result of interacting with BDA. In this case, new matrices are developed, based on the
data analysed and visually presented through BDA. For example, one audit firm acknowledges
the use of BDA to effect change in the practices and the process clients use to evaluate aspects
such as employee performance and planning.
As illustrated by the following comment from an interview, one audit firm has developed a financial stress index to measure staff efficiency.

But then you could say what insights can you draw from this information and you have to think about what are the dimensions of the data I have got that I can play with...

We recently came up with, we called it Financial Staff Stress Index. (Partner, P1)

However, despite audit firms suggesting BDA’s ability to provide insights, it appears the conceptualisation of this is different among them. Issues relating to auditors’ independence have an effect on how insights could be conceptualised and interpreted. See the interview excerpts below.

But what we can do is, if we are the auditor and we are doing some tax work for the client, you will find that, with permission from the client, we will allow the tax department to use the same data to perform work to support their tax work. If they are doing so in that respect we will involve other departments. But what we are not allowed to do is to get our advisory group to do a fishing expedition with the data if there is something they could go off and sell; that wouldn’t be appropriate using the client’s data. (Director, D1)

### 7.1.4 Implications of BDA affordances for the audit process

Some audit firms have indicated that BDA is used in all stages of the audit process, while others focus, at the moment, on either risk assessment or audit execution. Despite the differences, most firms have identified a number of areas for which BDA is proving to be useful, namely re-calculation, re-performance and analytical procedures. In re-calculation and re-performance, some firms state that BDA is used, among other things, to establish how a client’s impairment calculations have been derived. Auditors are also able to re-perform the bank reconciliations and ascertain the accuracy of the assertions included in the financial statements. The ability to re-perform and re-calculate is also extended to other areas in which management has used judgement to determine the figures, such as provision for doubtful...
debts in which non-financial data is elaborated to evaluate the assumptions. The areas identified in the interviews as currently performed by BDA are not new and are embedded in BDA to make them durable. This approach also shapes the routines and roles of auditors. Similarly, auditors are determined that BDA can indeed improve the functionality of existing audit procedures, for example enabling them to effectively re-construct a client’s accounting process to more easily verify the validity of assertions.

Further, BDA also allows auditors to perform analytical procedures based on large sets of data to establish trends and patterns (see Figure 7.4 below).

Figure 7.4 Areas where BDA is required (IAASB 2016a, p. 13)

While the areas identified are not new, as far as the audit procedures are concerned, it is the manner in which they are performed which is different. For instance, one audit firm has indicated that the capabilities embedded in BDA enable depth of analysis to be achieved in a structured manner. See the interview excerpt below.

There are some predefined tests we would run; for example, we can run a gross margin analysis. So, you know, the team pick the revenue account, the cost of sales account; the tool will calculate the gross margin and then you are able to compare that to what you will expect that gross margin to be. So, that’s really good substantive analytical procedure. (Director, D1)
In this regard, BDA provides a structured audit approach to collecting audit evidence. One partner highlighted that the structured approach in evidence collection, which enables patterns to be established, is also useful in detecting fraudulent activities. This acknowledgement links BDA to issues addressing regulators’ concerns about how material fraud risk factors are assessed and evaluated as per ISA 240. Below are two interview excerpts which highlight the relevance of BDA in detecting fraud risk factors.

So, often what happens is, at close of the year, December year end, they are in January raising journals but they are back posting those into the prior year. Clients are not doing that all the way through the year, and it’s just at the year end they are doing that. And so we are particularly interested in how often and how much does the client back post, because that could be an indication of fraudulent activity. So, that’s one of the analyses that we do here. This is one of my favorites [opens a laptop to show me a BDA dashboard on a screen]; this is showing you every single daily sale throughout the year, so you can very quickly see where are the patterns, where are the unusual movements, and so on. (Director, D1)

[We use BDA] definitely in planning and scoping to bring in and see data in a better way to use how the financial systems are being operated and the culture in different countries. Good examples are users; do we know, in country X, users are well controlled, conversely in country Y. We know, within the financial systems, users have access to everything, so there is no segregation of duties. This makes a big difference in how we plan the audit in those locations. Then we get into the actual audit, the risk focus or risk profiling approach; we only got a certain number of auditors where we put our effort. (Director, D2)

Apart from indicating that BDA provides a holistic picture of the transactions in a population, auditors also mention that BDA allows them to collect both financial and non-financial data as audit evidence from diverse sources. Statistical sampling is seen as only focusing on financial data, thereby restricting auditors’ understanding of the business entity (ISA 315).
Weaknesses in approaches to understanding client business make the fundamental premise of business risk audit flawed. Even though others indicate that such ability is still developing, they acknowledge that this could be useful in future in helping auditors understand the business environment. See the interview excerpt below.

What we are most interested in is focusing on the financial data because the audit is all about giving an opinion on the financial statements, but using non-financial data to support the work that we do to change the client on assumptions that they are making and so on. So, what we see the future of data analytics is combining that non-financial data with the financial data the client has and allowing us to perform analysis between the two. (Director, D1)

While there appears to be agreement about what BDA does and potentially could do, it is less clear whether BDA is blurs the application of testing of controls, and analytical or substantive testing as an audit procedure. Curtis and Turley (2007) indicated that one of the reasons for introducing BRA was to reduce the amount of substantive testing, thereby reducing the time spent on auditing. Some audit firms are of the view that it is a substantive procedure rather than a test control.

Data analytics is more of a substantive procedure than it is a control procedure, so you could perform that analysis across 100% of the transactions and then draw that conclusion without testing the controls. (Partner, P1)

If we can get that evidence without looking at management controls and we can say to the audit committee we have done our work and we are prepared to put our name to the set of financials as representing the true and fair position of the company then we have performed the objective of the audit. (Partner, P2)

As regards BDA, regulators appear to be concerned that it is a form of analytical procedure aimed at rationalising less work on an audit. They are also less convinced that this is not (an) incremental change and would like to see how BDA could be a form of substantive testing. See the interview excerpts below.

So, for example, here [auditors] talk about revenue recognition. So they have done
some work on data analytics, but actually that was just computer assisted audit
techniques for journals. So it’s only the journal aspects of revenue. There [are] talks
about inventory provisioning. So they were actually using their tool to compare the
selling price to the cost and to analyse the ageing. But those are fairly straightforward,
simple, which could have been done with an Excel spreadsheet. (Regulator, R1)

I gave you an example of analytical review where we took a contract and built a
picture. Regulators don’t like us doing data analytics on that at the moment. They are
not as comfortable with us doing that, as with us doing sampling transaction testing
and walk through. So they prefer transaction testing from a sample. Take this contract,
take this chunk of revenue, walk it back, do the control testing. Was it authorised? Is
the control being reviewed? As in, are the costs real?... all this sort of thing. They much
prefer that approach than us saying: “I will take the data and build it up, the data...
The onus is on the Big Four to prove... and prove over time that the Big Data analytical
approach is as good or better than walk through controls. (Partner, P3)

It could be argued that the use of BDA is changing the volume and nature of transactions
which can be processed as audit evidence. Despite early indications suggesting that audit
firms are still developing tools to make some of the traditional audit procedures applicable to
BDA, the consensus is that the boundaries in relation to the quantity and nature of audit
evidence which can be collected are changing.

**BDA is changing the audit process**

Audit firms, however, state that the exposure of BDA to testing 100% of the transactions in a
population is currently restricted to larger clients with Big Data. Smaller or medium clients
have statistical sampling applied as methods to determine the amount of audit evidence. The
focus on larger clients in employing BDA demonstrates a fundamental shift in audit practices.
Carpenter and Dirsmith (1993) indicated that, when statistical sampling was being
introduced, the target was also larger clients because they create the economic benefits for
audit firms. In this regard, the introduction of statistical sampling was portrayed as an economic rationale.

Therefore, it is clear that the expertise in data collection in this context does not reside with the auditor, but through interaction with BDA. However, to write scripts, auditors have to rely on data analysts. This could indicate that the expertise in data analysis is co-produced by data analysts and auditors but this is instantiated in BDA. Therefore, this shows that BDA use in audits also requires auditors to form relationships with other professions, such as data analysts from the field of data science, who have the skills and knowledge to transform audit procedures into scripts which BDA can understand for execution. This is important because, much as BDA affords auditors to collect data and execute data analysis on a larger scale and in a complex manner, their lack of expertise in coding scripts acts as a constraint. Auditors have to explain clearly what they would like the scripts to achieve so that data analysts can clearly develop scripts that conform to such requests. Sociomateriality, through its focus on both human and material agency, highlights the affordances enabled by BDA as well as evident constraints, thus showing relationality of auditors and data analysts emerging during the interplay of auditors (human agency) with BDA (material agency). This relationality has implications for organisational structure and the status of the audit function within firms.

### 7.2 The relationality of data and audit functions in constructing BDA expertise

As observed in Chapter 6 and in Section 7.1, BDA tools are algorithmically-based technologies which require, in many cases, high levels of computer programming skills. In traditional professional accounting training, the learning content does not include the computer programming lessons that could be vital for operating BDA tools. Therefore, auditors currently do not have the much needed expertise in BDA, which includes writing scripts using languages such as R and Python. This lack of expertise in the traditional audit engagement results in audit firms either relying on computer programming capabilities from other functions within the firm, such as data assurance, or recruiting data analysts who offer the required level of expertise to auditors in the use of BDA in audits.
Therefore, the drive for BDA in audits of financial statements appears to affect the structuring of and the relationships between functions within audit firms. There is evidence that most firms have departments or functions that harbour expertise in developing and managing tools to exploit Big Data. These functions are called either data assurance or risk advisory services (“data assurance” hereafter). Data assurance as a function offers a plethora of assurances, such as data recovery and cyber security, which are beyond the remit of what the audit function entails. Curtis and Turley (2007, p. 459) argue for the case of BRA that “implementation of [audit technologies such as] BRA would have benefitted from a different organizational structure, and one that was also better equipped to provide the consulting services”. Drawing from this conjecture, this study notes that audit firms rely on functions such as data assurance to leverage the use of BDA in audits and other assurance services. The audit team draws expertise from functions like data assurance to help them in developing and performing audit procedures in BDA in cases where the complexity of scripting or performing the audit test is beyond the auditor’s competence levels. As such, there is a considerable level of interaction between the audit function and data assurance teams, thus indicating the significance of Big Data in meeting the commercial goals of audit firms through consultancy-type work.

Functions within audit firms have changed and, in some firms, data-related functions are placed higher in the organisational hierarchy than the audit function. This arrangement indicates data assurance assuming a leading role in the application of BDA across all functions within the firm.

There is a data analytics that sits on top of audit, which bring together audit and advisory. Data analytics is an umbrella. Within audit there are analytics teams, so we have a risk analytics team and the assurance analytics team sit within audit. They report into audit but also report to this data analytics umbrella. The idea is we try and bring the best practice from what we are learning in advisory, tax and anything else, and try to bring it into audit. (Director, D1)
The significance of the data assurance function is also clear when audit firms describe BDA for audit purposes in their publicly available documentation. This raises the issue of the status of the audit function within firms in a data driven world. Data assurance is assuming autonomy in the development and management of BDA. Some of those interviewed recognise that the shift of data assurance from the periphery to the centre of the audit process in terms of the expertise it provides is very significant and could have implications for the conceptualisation of auditor’s independence and the required skill sets. See the interview excerpt below, which describes the position of the data assurance and audit functions prior to BDA being introduced into auditing on an industrial scale.

Data analytics was purely advisory and had no contact with the audit business. Then I joined [another Big Four] as part of the advisory practice, again there has been no contact with audit. The data analytics team at [this Big Four], when I left in 2014, still were not talking to audit. I know at [another Big Four], in audit, they were not doing stuff with data. (Director, D2)

One partner explained how BDA tools, such as Audit Command Language (ACL) and IDEA, have evolved from just being offered to selected big clients to having a full suite of clients on their profile. He indicated that the increasingly competitive audit market (Robson et al., 2007) and the high cost of operating such tools has led firms to develop “in-house” analytical products with functionalities similar to those of ACL and IDEA (see Chapter 2). These technologies have evolved over the years and this interviewee’s firm now offers their own in-house analytical tools to their clients at almost no cost as a service supposedly designed to support the audit process. The interview excerpt below provides some further insight.

The principle or objective of this platform, if you like, is to deliver analytics in a cost-effective way into all of our audits without consideration of the audit pay. So, all our clients, from top to bottom, have access to quality analytics, irrespective of whether they are big or small clients. (Partner, P1)
Some interviewees expressed the opinion that the use of BDA in the audit process has enabled various functions within audit firms to work together. These functions ideally are required to work separately because of concerns regarding auditor independence, since they provide non-audit services to clients. However, the introduction of BDA has seen audit firms re-adjusting or reorganising the way their functions operate to leverage the use of BDA in auditing. In this context, participants indicate that the audit function works together with functions such as data assurance, which provide assurance services by providing insights to clients on major projects dealing with massive amounts of data. Data analysts from data assurance are brought into audits to assist auditors with extraction and transformation of data to be used as audit evidence, and also to reinforce the importance of insights identified using BDA. In this regard, BDA enables auditors to generate insights which can spill over into consultancy-type work. Therefore, the construction of insights is achieved using BDA through the interaction of data analysts and auditors. Thus, the intersection between data analysts’ expertise and auditors’ knowledge of the client business locates the affordance of BDA in the generation of commercial value for audits. The materiality of BDA enables insights generated to have scientific appeal and to be implicated in meeting the commercial goals of audit firms (Andon et al., 2015). The corollary is that the material agency of BDA blurs the boundaries between the audit function and others. Prior studies (Jeppesen, 1998; Robson et al., 2007) show that there has always been an interaction between the two functions and that the delineation between the two is blurred. This might have implications again for the independence of auditors. In fact, BDA is used across the functions in audit firms.

Data analytics has exploded across the whole business. It’s certainly become the big thing that everybody is involved in. So, every aspect of our advisory business is looking at data analytics as well as audit. Everybody, in fact, has jumped on the same band wagon. What we tend to find with our advisory colleagues is when they got a completely new idea they would like to try it on the audit. (Director, D1)

The relationship between the data and audit functions also affects the composition of audit teams, their role and where routinised audit tasks are performed. The audit teams in many engagements include data analysts; however, some routine tasks are said to be performed at
shared service centres. It was noted that most audit teams are now made up of auditors and data analysts.

Eleven years ago, we had ten people on the audit team; all those were traditional ACA qualified auditors. Today, do you see the same resources? No, you need some people who have ACA qualifications; you need some people who are data scientists; and you need some people who are computer programmers etc. Today, you might have seven people as part of the core audit team, supported by three specialists who are doing the data analytics extract, transform and load process to allow the audit team to focus on high risk areas etc. It is still an audit team, but you bring different specialist skills. (Director, D3)

Some audit firms collect and perform audit tests remotely at shared service centres across the globe for other firms. The evidence indicates that all of the Big Four have, to some extent, outsourced the execution of some repetitive audit procedures to shared service centres, which are in countries such as India and Poland. It was noted that these centres now perform most of the audit procedures which junior auditors are required to perform, for instance re-performance of bank reconciliations and journal testing. Some firms in countries like Norway state that they rely on robots rather than shared service centres to perform routine tasks. They argue that language is a barrier in outsourcing their audit activities to other countries. FRC (2017) has argued that the use of shared services centres represents an approach of centralised processing of audit evidence. This approach differs from the current one in which audit evidence is processed remotely but in a distributed way. While this approach has issues to do with data security and integrity, at the moment, audit firms indicate that it could be the future of auditing as a result of BDA.

Sooner rather than later, more audit teams will become centralised; that means head office location and shared service location. For example, we gonna have more auditors in India, in the Philippines etc. etc., because that is where our clients have shared services. It definitely means we are bringing control and delivery of the audit close to the central partner team. (Manager, M1)
It should also be noted that, as well as having relationality-related consequences, shared centres may also lead to the reconfiguration of the audit process. Nevertheless, whether audit procedures have been performed in-house or remotely via shared centres, the partner or manager in data analytics then briefs his or her counterpart (engagement partner/manager) on the findings and how they should deal with the outliers identified. Some interviewees state that, at times, data analysts offer guidance to auditors on how the reports should be interpreted because of auditors’ limited understanding of what the reports entail. This is another emerging practice as the roles of auditors and data analysts are intertwined to interpret the evidence generated by the BDA. Here, BDA functionality produces a constraining effect on auditors’ ability to interpret the results without relying on data analysts. BDA facilitates the interaction between auditors and data analysts in the construction of what could be regarded as sufficient and appropriate audit evidence. In this case, the knowledge base of auditors requires that of data analysts to determine the quality of audit evidence.

7.2.1 Constraints: problems of relationality

The construction of BDA expertise among data analysts and auditors is not unproblematic. There is evidence of tensions between auditors and data analysts regarding issues such as relevance and autonomy. Prior studies by Fischer (1996), and Curtis and Turley (2007) have documented that audit firms are conflict-laden environments, in which the promotion and introduction of audit technologies are not unproblematic. While these studies have focused on administrative partners and practitioners, this study provides another dimension of tension between data analysts and auditors as their knowledge intersect (Abbott, 1998).

It is clear that the introduction of BDA and scripts in the collection of audit evidence means that auditors and data analysts are in regular contact from audit planning to completion. Such being the case, the issue of what procedures to use in the audit process is commonly addressed by the nature of the BDA tools. Therefore, it has become apparent that there is an issue regarding who decides what BDA tools are required to achieve the audit objective. In some audit firms, the data analysts indicate this to be their responsibility. This interview excerpt provides a basic picture of the tensions being encountered in that process.
We looked at all of those and looked at the advantages and disadvantages of each one and we chose Alteryx. So Alteryx is the predominant tool that the data group which I ran will use. SQL is obviously a bigger tool that is used globally so we wouldn’t necessarily let auditors run these tools. These are by specialists who understand how to use them; predominantly, at the moment, auditors are using IDEA. If I had my way, in a few years’ time, I would have all of them using Alteryx, which is a lot easier to use. (Manager, M3)

In the excerpt above, the data assurance manager demonstrates that they have autonomy over what tools should be used in the audit process. This quote is a clear manifestation of the issue of autonomy and how BDA facilitates the claiming of expertise by auditors and data scientists. The raising of Alteryx over the commonly used IDEA as only used by specialists is meant to demonstrate the territorial advantage which data analysts have in the practices used in the audit process. However, this manager also noted that it is not easy to convince auditors to use the tools his team decide on.

One firm actually stated that the use of powerful BDA tools is closely monitored to avoid those with limited expertise having access to them in case they end up using them on a client’s data in a manner not compatible with audit firm policies. Therefore, BDA accreditation policy is introduced, whereby data analysts in the audit team, or those from the data assurance functions, are allowed to use some BDA.

Some of these data analytics tools, like Alteryx, R or Python, are incredibly powerful tools and if you don’t know what you’re doing with them, you could probably cause more damage than you realise... The way we do it internally, we have an accredited tools policy. So, certain tools can be used by everybody coz we know that Excel IDEA or PowerBI are simple for people to use. For more complex tools, we say only specialists can use those. (Director, D3)
This has implications for the speed at which certain audit procedures have to be performed. Auditors have to wait for the data analysts to give them the go ahead on certain areas where they have used powerful BDA tools. In this case, data analysts are also involved in the interpretation of the output produced by these powerful tools.

Data analysts suggest that auditors’ displeasure with their lack of authority on the use of BDA is attributed to how they perceive themselves in this environment. Data analysts who were interviewed indicated that they would like to see their role being recognised as part of the core elements of the audit process rather than as auxiliary to it. They argue that, at the moment, data analysts are an integral part of the audit team because of the significant contribution they make to the audit process.

I think historically they have been very much seen as a support service [data analysts] so, as where I don’t want to do journals testing, you do that, sending my report back and I will review the exceptions. I think as time goes on they cannot be seen as a support service. I think it needs to be an integral part of the actual audit team, so that is one of the key strengths of the group that I run. So the data group, they still sit with the audit team; they are part of the audit team; they work very closely with them. (Manager, M1)

On the other hand, auditors seem to be concerned with the issue of status and the position of the audit function being downgraded. As far as the application of BDA is concerned, this is evident when interviewees within the audit function say that they do not have much support from the data specialists and that auditors are expected to do it themselves. This appears to be affecting their work.

They used to be the data analytics specialists before all this kicked off in the audit market. So, there is a sense that they actually would just be doing the data analytics for the audit function, but that’s not going to happen; we are going to do a lot by ourselves. So, there is a lot of organisational settling down at the moment to try to work out exactly who does what and how do we work together. (Manager, M2)
In order for data analysts to work on an audit engagement, auditors are required to make bookings on their availability. One interviewee was concerned by late bookings which auditors make in order to have data analytics on the team.

It can get very fractious actually, because we’ve had incidents where people have said: “Well, I can’t believe you’ve got nobody to do data analytics; I asked you last week” and actually that’s the way. (IT Auditor, A1)

Anderson-Gough et al. (2001) show how time management is a key attribute in auditors portraying their professionalism. Further, they also show how auditors use time consciousness to legitimise their practices and identity. Late bookings either could symbolise auditors’ perceptions of data analysts as regards to their role in the audit process or could signify the relevance of BDA as part of the practices embedded in the audit process. Whatever angle this may be viewed from, it is clear that auditors are also concerned with the cost implications that the use of data analysts might have on their budgets. In one interview, a data assurance manager highlighted the concerns that audit partners have with BDA in terms of its value to the audit. In this regard, BDA is perceived as triggering more work for auditors when outliers are identified in the population. Even though auditors are reassured of the comfort (Pentland, 1993) that BDA might bring to the audit, there is evidence that they sometimes ignore requests for help from the data analysts. The two interview excerpts below highlight the issues of BDA relevance and the ignoring of help from data assurance.

What is it actually gonna bring to my audit other than cost me a lot of money? So, I think it’s been a battle to say actually: “Yes, you have done an analytic before, but if you run these tests over payroll you get a lot more comfort and you can also add a lot more value to the client and the quality of your audit has improved.” (Manager, M1)

So, we had the list of all the audit teams, everything they were doing, and we would have to email them to ask: “Do you want this doing next year? Have we even still got
the audit?” And I think that’s a little bit of disconnection that we are trying to get over here by putting people who were on the audit into this group. (Partner, P4)

Therefore, as BDA becomes a common feature in audits of financial statements, what is clear at the moment is that the skills and expertise of auditors are deemed not to be up to the level needed for competent operation of BDA. Audit firms recognise that more has to be done to rectify the skills and competence gap between the new ways of doing audits and the existing skill levels (Turley et al., 2016).

Data analysts are required at the audit planning stage to develop scripts as per auditors’ requirements. The creation of data assurance and its role in the audit process has resulted in apparent tension between them and the audit function. In this regard, much as audit technology, through interaction with the audit function, reconfigures audit teams and organisational form (Suddaby and Greenwood, 2006), the process is not unproblematic. There is evidence of power struggles and of status being pursued in the process. Data analysts seem to want more recognition and to have autonomy over the BDA tools used in the audit process. On the other hand, auditors see data analysts as having more of a support function, at times being a source of inconvenience in terms of creating more work for the audit function, thereby affecting their budgets.

As the tensions regarding the role of auditors in a data driven environment have resulted in issues of autonomy and status for data analysts and auditors, there appear to be two avenues which audit firms have embarked on to make sure that they achieve a foothold in BDA.

7.3 Summary

Overall, this chapter has discussed the implications of BDA for the conduct of the audit process, addressing the initial research question of how the properties of BDA impact the conduct of audits in multidisciplinary firms. The chapter has relied on the theoretical lens of the affordance construct from sociomateriality (Hutchby, 2001), in particular the concepts of reconfiguration and relationality (Wagner et al., 2011), to navigate and present the empirical
data. The affordance construct has given the opportunity to investigate the affordances and constraints (Leonardi, 2011) that BDA presents for auditors. The chapter provides evidence that, in addressing the problem of inference (human agency), BDA is reconfiguring some aspects of the audit process. The affordances of BDA mean that its use is leading to a reconfiguration of the audit evidence process because there is considerable use of scripts in collecting data from clients’ data warehouses. The collection of data is largely done either by data analysts who are situated at the client premises (especially for new clients) or by remotely using shared centres. The role of auditors at this point is minimal in many cases; data analysts collect and process the data as per auditors’ requirements or the firm’s standard audit procedures, which are encoded on a questionnaire. The processing of data involves cleaning the data to remove empty fields and duplicates. It also involves data analysts developing scripts that perform audit procedures, such as analytical procedures, recomputation etc. The data analysts produce reports which are then sent to auditors for further analysis.

Another feature which is prominent in BDA is the use of visualisation tools, which are used as part of communication and marketing purposes. Using visualisation, auditors are able to show outliers in a graphical and animated way to each other within the team but also to clients. When visualisation is used by auditors, it can affect their professional judgements because audit evidence can be manipulated and presented in various dimensions. With clients, visualisation tools are used as a means of showing how audit judgements have been derived, as well as the areas which require attention for either audit purposes or operational efficiency. The latter is referred to as insights, which can provide a basis for consultancy-type work.

Therefore, affordances of BDA include offering greater coverage in terms of operational scope and depth. BDA enables all transactions in a population to be collected and analysed, which is not the case with statistical sampling. Further, the use of scripts means that existing audit procedures can be automated and, in some cases, customised to respond to auditors’ needs. Finally, audit tests can be performed remotely from clients by using shared service centres.
Given these affordances, audit teams now include data analysts who assist auditors in writing scripts for data collection and evidence gathering. This demonstrates that, despite offering affordances, auditors do not have the relevant expertise to operate some of the functionalities of BDA which could be regarded as essential in audits, such as the writing of scripts. Constraints related to expertise have seen auditors relying on data analysts to perform audit tests and produce reports and audit evidence. The corollary is an elevation of data related functions (risk advisory and data assurance services) above the audit function in some firms, thus indicating that audit evidence and insights in data driven environments are based on the interplay of human agency (auditors and data analysts) and material agency (BDA). This interplay also highlights power relations as data analysts and auditors negotiate audit procedures and reports. Data analysts seem to have autonomy over the BDA tools and subsequent reports produced, which sometimes does not sit very well with auditors. This demonstrates a jurisdictional challenge over who owns audit evidence in data driven environments.
CHAPTER 8: DISCUSSION AND CONCLUSION

This chapter provides an overview of the evidence about the use of BDA in audits of financial statements that is presented in Chapters 5, 6 and 7. It also offers insights into the findings and identifies areas of potential research. This study follows in the tradition of earlier literature that contextualises the use of audit technology as socially constructed. That literature suggests that understanding of the adoption of BDA in auditing can be seen in the longer term historical context of developments in audit technologies such as statistical sampling, the ARM and BRA (Carpenter and Dirsmith, 1993; Power, 2007). Studies show that, despite being promoted on the basis of technical efficiency, audit technologies serve other symbolic roles. Such roles are driven by the need for firms to address regulatory concerns and to also remain competitive in the audit market (Robson et al., 2007).

There has been a great lack of empirical accounts of BDA and this study attempts to address this gap in the academic literature. As with prior developments in audit technology, the study also appreciates that BDA can have multiple roles in maintaining the social relevance of auditing and, as such, the way it is being introduced to relevant stakeholders in the field is as important as the way it is embedded within audit firms. Therefore, to understand the holistic nature of BDA and its social relevance in auditing, the evidence was collected through observations of BDA tools, through semi-structured interviews with relevant individuals about BDA in general, as well as in audits of financial statements, and through publicly available documentation on the same. This material was analysed using three theoretical constructs, namely rhetorical strategies (Suddaby and Greenwood, 2005), identity regulation (Alvesson and Willmott, 2002) and affordance (Hutchby, 2003), which are drawn mainly from the theoretical perspectives of NIT (Meyer and Rowan, 1977) and sociomateriality (Wagner et al., 2011).

The rhetorical strategies and identity regulation constructs allowed the researcher to understand efforts by audit firm administrators in making sure that BDA is accepted outside and within their firms. The construct of identity regulation allows the study to explore the implicit and explicit means which administrators use to encourage auditors (at all levels) to
talk about or use BDA in audits of financial statements. The construct of affordance added another dimension to the understanding of BDA in the auditing context, but one attending to the ways we can understand the properties of BDA technology in influencing auditors and the audit process. The complementarity of theoretical constructs was necessary to understand three key areas addressed by the research questions, namely promotion of BDA to relevant stakeholders, embedding of BDA in the audit function, and properties of BDA and their influence on the audit process.

Therefore, this chapter is structured as follows. Section 8.1 provides a summary of the findings for the three research questions. This is followed by Section 8.2 which discusses the implications of the study. Section 8.3 discusses the contributions of the study while Section 8.4 identifies its limitations and the potential avenues for future research. Finally, Section 8.5 provides the conclusion.

8.1 Findings from the empirical evidence

Chapter 5 addressed research question 1: What are the strategies audit firms employ to promote the relevance of BDA to relevant stakeholders? The evidence revealed that audit firms use a wide range of rhetorical strategies to connect BDA with shared values and norms in auditing. Thus, firms attempt to gain legitimacy for BDA by demonstrating in their official accounts and narratives that BDA improves audit quality and also adds value for clients. This analysis of the promotion of BDA, based on the ways firms frame accounts connecting BDA to the value system of auditing, is important. It shows how audit firms deliberately rely on discursive rhetoric to manoeuvre the political and social landscape of the audit field in which conflicts and motives of self-interest are inevitably present. In this way, rhetorical strategies are not inadvertently used but are choreographed to suit a particular audience at a given place and time.

For instance, teleological arguments are put forward to both clients and regulators to show that BDA has the capacity to improve audit quality, thereby linking BDA to the production of moral (procedural) dimensions of legitimacy. These arguments advocate that the current
audit technologies are not as effective in a data driven environment as BDA and that a radical change is needed to break from the past. BDA is presented as the means to capture a plethora of audit evidence that could assist auditors in risk assessments and in providing audit opinions that reflect the economic reality of clients. Further, they argue that BDA enhances the identification of fraud risk factors, thereby addressing some of the concerns being highlighted more often in regulators’ audit quality inspection reports. Audit firms use ontological rhetoric to address the concerns raised by regulators about the intended use of BDA. Regulators appear to be concerned that BDA blurs the delineation between audit and non-audit services, which could affect auditors’ independence, and hence audit quality. In order to make this case more plausible, auditors use past experience and reputation to provide a historical argument that they are well placed to provide quality audits in a data driven environment. Value added rhetoric is used when audit firms show that audit procedures performed with BDA are valuable, since they give auditors greater coverage and depth in the collecting and analysing of audit evidence. This rhetoric thus gives BDA technological and symbolic roles, which demonstrate auditors’ expertise in a data driven environment and also enhance the quasi-scientific appearance of audit procedures and the audit profession. Auditors claim that their professional judgement is enhanced because BDA has visualisation capabilities that can be used to highlight areas which cannot be easily uncovered with the naked eye.

In acquiring pragmatic legitimacy for BDA, audit firms use value-based rhetoric to show the benefits that clients could gain from using BDA. These benefits relate to the operational efficiencies that clients would derive from the insights that BDA can reveal. The role of visualisation facilities in BDA is promoted to demonstrate how various client businesses and processes can be improved by the information derived from BDA algorithms. Audit firms also use cosmological arguments to show that technological advancements are inevitable and that the current trend would leave clients with no choice but to adopt BDA into their systems.

Chapter 6 provides evidence to address research question 2: What means do audit firms use to embed BDA in the conduct of the audit? The empirical evidence shows that audit firms have put in place explicit and implicit means that are designed to encourage auditors to use BDA tools. The evidence also shows that, within these means, audit firms construct BDA-
inspired discourses to offer hope and aspirations to auditors. BDA is presented to auditors as an appropriate response to the challenges associated with clients’ information environments and their demands for an audit that adds value. It is associated with overcoming the anxieties auditors have in making professional judgements. From an auditor identity perspective, BDA is portrayed as the solution to the concerns about auditors’ central interests in life, their distinctiveness and relevance.

Auditors are subjected to several implicit and explicit means by administrators in an attempt to shape them into data-inspired auditors. These means are recruitment, training, career progression, personal incentives, performance evaluation and the industrialising of BDA tools (automating audit procedures). The evidence shows that the pattern of recruiting auditors is changing within firms. The use of BDA in audits is prompting firms to recruit individuals with both computational and analytical skills.

The evidence also shows that there are many BDA-inspired senior positions. These positions play three significant roles in encouraging the use of BDA. First, they are used as a means of communicating to auditors that audit firms’ management are committed to BDA as part of the strategic goals. Second, the administrators are showing auditors that there is a BDA-inspired career progression to senior management for those auditors who intensively use and demonstrate leadership on BDA. Finally, those in senior positions offer guidance to those trying to learn how to use BDA.

In order to upgrade auditors’ technical capabilities in BDA, formal training is offered. Audit firms encourage auditors to undertake training by offering them, among other things, an opportunity to work in other functions with high intensity data analytical roles. In some firms, the formal incentive systems now include the use of BDA as part of performance evaluation of auditors. Some participants indicate that the use of BDA in audits can have an effect on the pay increments and bonuses which they may receive. Auditors have to show how they have used BDA to improve the quality of their audits and also how they have used it to assess risk, especially fraud risk factors (ISA 240). Firms also make sure that most audit practices and procedures should be performed by BDA. Auditors are given BDA, by which various audit
procedures could be performed, and these tools are designed or presented in a user-friendly way.

Chapter 7 addressed research question 3: How do particular properties of BDA impact on the conduct of the audit in a multi-disciplinary firm? The aims of this question include assessing the changes that BDA is bringing to the audit process. Another is to theoretically overcome the blind spots which tend to be overlooked in NIT approaches, by focusing more on linguistic devices than on the materiality of objects. Using affordance constructs provided the lens to uncover two important issues that emerge when there is an interplay between auditors and BDA (sociomateriality), namely reconfiguration and relationality. The chapter revealed that the algorithmic scripts and visualisation tools in BDA are the key properties that transform the operational and cognitive capabilities of auditors. For instance, claims of the wider coverage and greater processing power of BDA in Chapter 5 are made possible because BDA relies on scripts which are written using powerful computer languages such as R and Python. These languages allow auditors to collect more information stored in multiple data warehouses on companies’ ERPs, thereby enhancing the ability of auditors to have a wider operational scope in the audit process. SQL, another computer language for dealing with structured and relational databases, is written to collect and manipulate data according to the needs of auditors. With scripts, auditors collect 100% of transactions in a selected population, which is a property not available in statistical sampling. Therefore, BDA affords auditors to automate some audit procedures, which reduces the time taken to collect and process the information which could be used as audit evidence. While scripts relate to the inner operations of BDA, visualisation tools offer auditors a means of analysing data through visuals such as graphs and pictures. Auditors indicate that visualisation tools in BDA are changing the way they communicate audit evidence and form the basis for their professional judgements. Such is the case because visualisation tools present data in different dimensions with flexibility and in real time. It is at this point that insights highlighted in Chapter 5 are instantiated and communicated to those charged with governance.

Despite being able to collect and analyse data in different ways, BDA constrains auditors in performing certain functions such as physical inspection of inventory (this could change in future with machine learning capabilities being researched). Also, auditors’ lack of expertise
in data science or computer programming constrains them from performing and understanding certain functions in BDA. Reconfiguration, therefore, relates to the drive for automation in audit procedures and also to the role of visualisation in shaping how auditors are able to derive professional judgements about, and insights into, clients’ operational efficiencies.

In terms of relationality, the changes that BDA is bringing to the audit process are profound to the extent that they influence and affect the relations among functions within firms. The use of BDA in audits has brought the audit function closer to other functions which include expertise in BDA. Functions such as risk advisory and data assurance services are actively engaged with the audit function, leveraging the BDA capabilities. Such an arrangement also affects the status of the audit function within firms as well as the place where routine audit procedures are carried out. It was noted that shared services, which are dispersed across the globe, perform routine tasks. There are also tensions that are exhibited when data analysts interact with auditors. Auditors suggest that their autonomy over external audit is challenged since data analysts also have autonomy regarding the nature of tools to be used and the reports to be produced.

Therefore, much as BDA offers auditors an opportunity to navigate and analyse large volumes of diverse data, there are also limitations as to what BDA can enable auditors to do at particular points. Issues such as expertise, status, data security and lack of guidance on BDA in firms’ audit methodologies are some of the areas that pose a greater challenge in the way properties of BDA influence the audit process.

8.2 Discussion and implications of the study

In sum, the three empirical chapters have revealed a number of significant findings which could enhance our understanding of BDA in the auditing of financial statements. Four principal issues emerge from the empirical evidence. The first relates to the adoption into auditing of vocabulary from the body of knowledge of data science. This enables the audit profession to speak the language associated with BD in audits of financial statements. The
second is the automation of the audit process and the use of visualisation tools. Thus, the use of terminologies from data science correspond to the desire of firms to automate procedures in the audit process. Further, such automation is accompanied by the introduction of visualisation tools, highlighting the importance of audit technology in the way auditors make professional judgements. The third issue, the corollary of the aforementioned issues, points to the need for auditors to acquire new skills associated with data science so that they can perform or understand the automated audit process and interpret the results from visualisation tools. In this regard, the issue of de-professionalisation is discussed below.

Finally, there is an issue of the business of auditing which is linked to the role of insights derived from BDA and concerns about auditors’ independence. These issues are identified because they offer an opportunity to see the role of BDA in methodological change in the audit process and in the change in auditor identity in the data driven environment, as well as the impact of and the motivations for these changes.

8.2.1 Adoption of jargon from data science

It is clear from the literature and evidence collected that BDA is a recent phenomenon; however, auditors have been using some form of analytical tools for over four decades, but only with a very limited number of clients. Advancement in technology has enabled BDA to acquire an interesting position in the audit space given that clients’ systems store and process large amounts of diverse data. This observation links BDA to the conceptualisation that formation and transformation of auditing happens at the margins (Power, 1997; Miller, 1998). However, this conceptualisation requires firms to populate the associated vocabulary from the body of data science knowledge and to frame the use of BDA in a manner that resonates with the vocabulary in both auditing and data science. Firms do this with data science jargon such as “predictive analytics”, “integration of data”, “insights”, “machine learning”, “algorithms”, “regression analysis”, “data cleansing”, “data integrity”, to name a few terms found in official auditing publications. This jargon is attached to common terms in auditing, such as risk assessment, professional judgement and audit evidence, to show that these two bodies of knowledge intersect.
Therefore, audit firms use this jargon to make claims of an improvement in the way audits are now delivered while, at the same time, BDA problematises the existing audit technologies, such as statistical sampling and BRA. Audit firms’ use of teleological, value-based and cosmological rhetorical strategies in dealing with those outside the firm (clients and regulators) could be seen as a means of bringing these two bodies of knowledge together to make claims for the relevance of BDA in auditing. Further, this jargon is incorporated, for example, into audit methodology, training and the recruitment process for new auditors, which firms use as a means of conditioning auditors to see themselves in a data driven environment. In this regard, changes in methodology are more than changes to the ways audits are conducted and are also a platform for revising auditors’ identity by bringing in the language that corresponds to the current environment within which auditors operate. The use of identity regulation allows an understanding of the BDA-inspired discursive strategies which are being employed to reconstruct auditors’ identity. BDA is portrayed as a means of addressing the problems of audit evidence collection and analysis. In this case, data science is used by auditors to develop or bring in tools and also to construct the vocabulary that links auditors to the expertise in a BD environment. This is important because concerns of audit quality and auditors’ status appear to be resolved through the use of BDA and also through incorporating auditing expertise within another body of knowledge in data science. From this analysis, one can observe that the use of relevant vocabulary at the intersection of auditing and data science creates a space which audit firms can use to address regulatory concerns and to create a competitive advantage. It also offers a platform requiring the need for a new form of identity so that the audit profession can remain socially relevant in the data driven environment. This is achieved through portraying BDA as the audit technology that could improve audit quality beyond its existing state because it is argued to offer greater processing power and the ability to offer insights through visualisation tools. Audit firms therefore use institutional vocabulary drawn from the field of data science to become part of the repertoire of auditing. This corresponds to promotion of BRA, with vocabulary from risk and strategic management populating the auditing literature and standards as part of the mechanism to institutionalise the use of BRA (Khalifa et al., 2007; Robson et al., 2007).
8.2.2 Automation and visualisation tools

The study also shows that there is a strong drive from the audit firms to automate most routine procedures such as bank reconciliation and receivables circularisation. This is coupled with aids, such as decision trees, to support auditors in making professional judgements. This points to efforts by firms to make the audit process as structured as possible (Power, 1997). Prior studies have indicated this direction of travel since the audit space has become a litigious environment and is also subject to audit quality inspections. Properties of BDA facilitate the automated nature of the audit environment enabling the creation of shared service centres where most of these routine processes take place. This indicates issues of how and where auditing will take place with advances in machine learning and artificial intelligence pushing the agenda for external audit to be fully automated.

Further, the role of visualisation tools is becoming more pronounced, which auditors argue is shaping the way they form their professional judgements. Visualisation tools also show how the process of risk assessment in audits is socially constructed. In this regard, visualisation provides ways of displaying areas of risk and a framework for discussion with management on the severity of each risk identified. This process is not objectively carried out but is subject to negotiation and customisation to reflect the involvement of auditors, clients and BDA.

The automation of audit procedures and visualisation tools are part of the formalisation of the way audits are conducted. Dowling et al. (2008), for example, find that auditors who had adopted a very prescriptive decision support system identified fewer business risks than those who used a less prescriptive approach. They suggest, in particular, that a “hard” structured approach encoded in the new technology could limit the cognitive ability of auditors to generate many cues for assessing audit risks associated with the business. For years, the mystery surrounding what auditors do has enabled them to encourage a perception of a judgement intensive practice that warrants higher fees.
8.2.3 Re-skilling and potential de-professionalisation

‘Re-skilling’ in this context relates to auditors having to acquire a wider set of skills which strengthens professional identity in the data driven environment. The study shows that the permeability of auditing to accommodate BDA tools and concepts from data science has created the issue of upskilling. Auditors are expected to possess capabilities required for data analysis in a BD environment as well as to have the traditional technical auditing skills. This means that modern auditors’ skills should include, on top of auditing knowledge, more technical knowledge of computer programming languages such as SQL and Python. This therefore has implications for the manner in which practice provides a suitable environment for the development of auditors as professionals (Turley et al., 2016). The use of the term “data scientist” is becoming more commonplace in auditing, which suggests auditors’ preference for imagining themselves as sophisticated experts, at least as far as data processing and analysis is concerned. However, it is not clear that mastering more quantitatively oriented skillsets leads to better auditors and better auditor judgements. Power (1995) encourages us not to assume auditor’s expertise as given, but as (co-)produced.

On the other hand, there is also an issue of how a focus on analytic tools affects the conduct of the audit process. If auditors rely heavily on the algorithms in BDA when making decisions in that process and arriving at conclusions, then there is a potential consequence that professional judgement is diminished through over-reliance on routines/procedures and ultimately machines to do the work of arriving at judgements. This raises concerns, which are well documented in the professionalisation literature, about the potential “de-professionalising” effect of highly technically oriented work environments. Abbott (1988), for example, emphasised how reliance on mathematical techniques potentially dilutes professional systems of knowledge and diminishes the image that professionals create for themselves, because it is primarily on the basis of their expert knowledge that professions build their jurisdictional authority, legitimacy and public image. In the audit context, Omoteso et al. (2010) state that automated audit technologies have the capacity to change the organisational structure of audit firms as some tasks previously performed by auditors are taken over by the technology, implying a deskilling effect of such changes on audit
professionals (see Dowling et al. (2008) for a similar view). Power (1997) raised similar concerns when arguing that, if the idea behind the rise of statistical audit sampling was a project to construct and codify auditors’ knowledge base, then the outcomes were somewhat mixed.

8.2.4 The business of auditing

Given that audit firms are also in a competitive environment, findings demonstrate that the employment of BDA can be seen as relevant to the ‘business of auditing’, potentially affecting audit costs and the efficiency of audit work. Here, there is a need for a more critical assessment of whether firms’ representation of BDA as the next big thing in the development of audit practice is driven, at least to a certain degree, by their strategies for business expansion and by competitive rationales whereby BDA may be used as a tool for further differentiation and segregation between the large and smaller audit firms. The latter could struggle to achieve the level of investment in training and development necessary for the application of complex BDA tools. Economic motivations behind the rise of BDA should constitute an important research agenda that could shed light on the extent to which the penetration of BDA into auditing is not only a consequence of audit clients’ changing business realities but also a product of audit firms’ pursuit of their own strategic agendas.

Moreover, the quest for further business opportunities to be exploited in an era of BDA is likely to affect the fluidity of the boundaries between audit and consultancy work (Jepperson, 1998; Robson et al., 2007). Prior audit literature provides ample evidence of audit firms’ efforts to expand their services into new, often consultancy oriented, activity domains (Shafer and Gendron, 2005; Andon et al., 2015) by pursuing an image of auditors as “versatile experts” (Guo, 2016, p. 100) who can withstand the competitive nature of the audit field, while also upholding the normative values of the profession. Similarly, given the scale of investment required in the process of developing and maintaining BDA algorithms, software and tools, it is unlikely that auditing alone can generate sufficient resources to support the necessary investment and the auditor will, as a result, end up using analytical tools which have been created to serve the needs of the firms’ other service lines. The BDA tools
themselves may therefore not reflect a purely audit mind-set. The danger here is a mind-set that is more client service oriented regarding the underlying purpose and justification of the audit. This is something that goes to the heart of what might be called auditors’ “self-worth”; that is, how they perceive the value of the activity they undertake and its connection to something valued by management and the board.

8.3 Contributions of the study

This study has made five significant contributions to our understanding of BDA in audits of financial statements and also to the existing body of auditing research. The contributions are: the significance of complementing theoretical lenses, (re-)conceptualisation of auditors’ identity in methodological change in auditing, the role of material objects in the shaping of the audit process and related functions within audit firms and providing an evidence-based understanding of BDA to the body of academic literature as well as to the debates on audit policy making. These can be grouped into theoretical, empirical and technical contributions.

8.3.1 The relevance of complementing theoretical lenses

The study has used three diverse but related constructs, namely rhetorical strategies, identity regulation and affordance, to understand the way BDA is implicated in the social relevance of auditing. Rhetorical strategies and identity regulation are drawn from NIT, whereas affordance is drawn from the sociomateriality perspective. In sum, the three constructs demonstrate the relevance of complementing theoretical constructs to enhance understanding of a complex phenomenon, as well as overcoming the blind spots inherent in a particular theoretical framework. Jones et al. (2013) suggest that researchers should use theoretical constructs that recognise the relevance of material objects in studying institutional change, so that deficiencies of NIT can be mitigated. Given that this study investigates an institutional change in auditing, it has also used NIT constructs. However, in general, prior studies in auditing have used these (rhetorical strategies and identity regulation) (Empson, 2004; Suddaby and Greenwood, 2005) by focusing on discursive strategies with no attention paid to the role of material objects. This was also the case in the
context of audit technologies, in which studies have not adequately explored the relevance of material objects (Carpenter and Dirsmith, 1993; Robson et al., 2007). In this study, both the role of discursive practices and material objects are seen as complementary in understanding the promotion and embedding of BDA in audits. Chapters 5 and 6 provided evidence of discursive practices through rhetorical strategies and identity regulation to respectively understand the promotion and embedding of BDA. The study also relies on the affordance construct to understand the role of material objects in audits. In particular, it facilitates the understanding of the properties of BDA in shaping the audit process through its interplay with auditors. In doing so, the study adds to the body of prior studies in auditing which have used NIT to make the case that the complementarity of NIT with other theoretical constructs offers an opportunity to understand the complex nature of audit practice.

8.3.2 (Re-)conceptualisation of auditors’ identity in methodological change in auditing

The study has also extended understanding of BDA, which is largely conceptual (Alles, 2015; Earley, 2015), by providing accounts of the lived experiences of those engaged with the technology. In this regard, the study shows that audit firms attach meanings that are linked to the wider belief system of auditing. Such a process also includes firms’ efforts to influence the way auditors see themselves (identity) as a means of bringing methodological change to auditing. This, therefore, provides a novel understanding of methodological change in auditing as a means through which auditors are urged to change their identity in order to remain socially relevant. Previous studies have viewed methodological change in auditing as relating to the procedures that auditors use, disregarding the identity work that is part of such methodological transformations. Here, audit technologies are not only seen as forms of administrative control to monitor auditors from a distance (Carpenter and Dirsmith, 1993; Edgley, 2014), but also as a means of changing their identity to reflect the programmes of change put in place by administrators. Extending this contribution, the study also places identity at the focal point of understanding institutional change in fields such as auditing. Studies on identity regulation in auditing have focused on important aspects of the field, such as being professional, enterprising and managing time (Empson, 2004; Anderson-Gough et
al., 2006). This study enhances our understanding of the role of identity in methodological innovations such as the rise of BDA in the audit process.

### 8.3.3 The role of material objects in the shaping of the audit process

The current studies in BDA assume that its adoption is geared towards achieving measurable utility in terms of its effectiveness (Cao et al., 2015; Zhang et al., 2015; Perols et al., 2017; Appelbaum et al., 2017, 2018). While such a view has its merits, it tends to downplay the political nature of audit firms (Humphrey and Moizer, 1990; Curtis and Turley, 2007) and also ignores the role of material objects in the audit process (Fischer, 1986). This study offers an alternative view that shows the adoption of technology such as BDA as co-produced through the interaction between relevant actors in the field. In this case, the properties of the audit technology are examined to understand the influence they have on auditors and the audit process. Drawing on the construct of affordance (see above), the study shows that the properties of BDA offer the opportunity to identify areas where BDA either helps or constrains auditors in performing audits. In this regard, the properties of BDA are accredited with configuring the operational depth and scope of auditing, as well as the relations within audit firms and markets. Thereby, it is shown that one way of understanding how changes in audit technologies become enacted in practice is to look at the assemblages between human agency and material objects, and at how humans draw on the properties of the technology in question in pursuing the desired means.

In a similar vein, the study also contributes to an understanding of visualisation tools as material objects in the audit process and in communication with audit committee members. Lately, there has been a strong interest in the accounting literature in exploring the use of visualisation in the constitution of accounting practices and organisational life (Williams, 2013; Quattrone, 2017). In this regard, visualisation tools are said to highlight areas which require auditors’ attention and avenues for increasing income streams for audit firms. This points to the emergence of visualisation tools as a form of justifying auditors’ professional judgements in the event that audit committees or regulators require clarification on matters of audit interest (Williams, 2013). In this regard, the use of visualisation tools is implicated in
the psychology of auditors in terms of how decisions in the audit process are constituted. Visualisation tools also enable us to understand the shift in the way auditors generate areas which have potential for consultancy-type work (Jepperson, 1998). Visualisation tools allow auditors to show clients areas in which potential improvements may be required in their businesses. Doing so presents clients with possibilities for generating extra revenue streams compared to other businesses of similar nature. Therefore, the study has revealed how functions such as risk advisory services benefit from insights discovered in the audit process regarding the development of other assurance services. This might have implications for the perceived independence of auditors as well as for the business of auditing.

8.3.4 Offering an evidence-based perspective on BDA

This study is one of the first empirical accounts providing a perspective on the rise of BDA in auditing. It places the emergence of BDA-inspired approaches to auditing in a broader context of developments in audit technology and links them to the fundamental concerns and challenges facing the profession, considering the impacts of BDA on auditors’ ability to maintain (the appearance of) audit quality, on the era of auditing as a socially valuable function, and on the place of auditing within an increasingly multi-service and multi-disciplinary audit firm environment. In doing so, the study contributes to the extant literature that has investigated many previous technological changes in auditing by demonstrating that the arguments of increased effectiveness and efficiency of audit work lie at the heart of auditors’ rhetoric supporting the use of BDA, but also that such rhetoric disguises the more implicit motivations for BDA as something that can generate knowledge spill-overs for the provision of other, consultancy-type services.

8.3.5 Offering evidence-based research on BDA to audit policy makers

Finally, BDA is the subject of discussion in many platforms of public policy, including at the regulatory and standard setting levels in auditing. This study provides a holistic account of what is being discussed and the challenges being encountered. It highlights areas of concern about the expertise of auditors in terms of technological capabilities, the relationship within audit teams between data analysts and auditors, data security, ownership of audit evidence,
the continued tension between structure and professional judgement and, finally, the blurring of the delineation between audit and consultancy which has implications for auditors’ independence. These issues could inform regulators and standard setters on how to carefully consider BDA influences when deciding on whether to incorporate it into auditing standards. Audit firms could benefit from this study in terms of how they could tailor their recruitment and staff development programmes towards BDA.

8.4 Limitations of the study

Despite the aforementioned theoretical, empirical and technical contributions, the study has a number of limitations. These relate to the context and methodological approach used for the study, as well as to the inferences which can be made from such empirical findings. As such, these limitations should be taken into account when understanding the context in which this study has attempted to understand the social relevance of auditing in a data driven environment.

The first limitation is the context in which this study was conducted. The study only focused on big audit firms which have dynamics that are so different from small and medium sized firms. However, these smaller firms also encounter the audit environment characterised by Big Data. As such, the findings may not apply to, nor provide a narrative account of, what is happening in firms other than the big audit firms. This is important because prior studies, such as Kutum et al. (2015) find that the motivations for adopting audit technology (BRA) in smaller firms are different from those in the big audit firms and further, the use of audit technology varies among small and medium sized firms (Van Buuren, 2014). Also, the study has collected much of its data from big audit firms in the UK. This is a limitation in terms of making wholesale claims about BDA in audit firms because, globally, not all national offices of big audit firms may embrace BDA in a similar way. These audit firms are in countries which have different regulatory and cultural environments from the UK in terms of how data is managed and secured.
The second limitation is the source of empirical evidence used in this study. The evidence collected represents an indirect source in terms of actual practice. The study has relied on accounts of BDA narrated mainly by those who deal with it in audit firms, regulators and standard setters. The evidence also included publicly available documents produced by the same people. Given that understanding BDA in audits is a complex endeavour, the study would have benefited from the perspectives of clients, who are the targets for the use of BDA when they are being audited. In this regard, the study provides a limited perspective on BDA which would be enhanced if clients’ views and experiences were sought. Further, the study could also have benefited from observing the actual conduct of audits in which BDA was used in order to capture back stage use of BDA (Power, 1997; Curtis and Turley, 2007).

The third limitation of the study is also concerned with the methodological approach. The study only focuses on data collected between 2015 and 2018. This period is relatively short for capturing the transformative nature of BDA and some of its related implications. However, discussions on BDA in the audit field are still going on, so the dynamics of BDA, in terms of the meanings auditors attach to it and its interpretation, might change. Therefore, it is useful to understand BDA on a longer term basis in order to establish its impact. This might require a longitudinal study to try to understand the evolving nature of BDA and its related concepts. This could be timely, as IAASB is still working on its project on BDA and is yet to come up with definitive responses as to how to envisage BDA in audits of financial statements.

The fourth limitation of the study also relates to the methodological approach. In this regard, the study acknowledges that use of the interpretive approach and qualitative research methods has limitations in terms of making general inferences about the findings. Even though the study offers a greater depth in understanding BDA, its findings cannot be generalised across the audit field (see first limitation) and has no claims to the predictive ability associated with the functionalist approach and quantitative research methods.
8.4.1 Avenues for further research

The aforementioned limitations also offer opportunities for further research. First, potential research could address the area of understanding client perspectives on the use of BDA in audits of financial statements. So far, IAASB has collected clients’ views on BDA in audits in response to their request for input to their DAWG project. Some clients have expressed concerns about BDA in terms of data security and integrity. This could be an interesting area given the recently introduced General Data Protection Regulation and researchers could explore this avenue using either qualitative or quantitative methods to collect data.

Secondly, it would also be interesting to explore the use and implications of BDA for audits conducted by small and medium sized audit firms. This could be significant in a number of ways, such as exploring the rationale for and the actual use of BDA by those firms. Researchers could also explore the effect on auditors’ identity in smaller audit firms in which this might be different from big audit firms. In bigger firms, it is documented even in this study, that auditors are encouraged to have an entrepreneurial mind-set. This might be at odds with the identity of auditors in smaller firms and might have implications for the way professional bodies such as ICAEW and ACCA set the contents of professional training programmes.

The third avenue of research could be extending our understanding of visualisation tools. In this case, research on audit judgements could explore how decisions are derived when visualisation tools are used in an audit environment. Researchers could assess and evaluate the outcomes of judgements which auditors make when the information on visualisation tool dashboards is altered given different scenarios. The researchers could establish whether auditors using visualisation tools are able to identify more risk factors and insights than those who do not. This is significant in informing about the psychological effects of visualisation and the nature of professional judgements that are derived. This could involve the conducting of research on a live audit engagement in which BDA is used (ethnography) or in a slightly controlled environment (quasi-experiments).
A further topic of research could focus on conducting a longitudinal study on BDA. Given that audit firms indicate that BDA enhances the quality of audits, this claim could be put to the test by establishing proxies (De Fond and Zhang, 2014) that could capture audit quality in a data driven environment. The study could involve assessing the auditors’ ability to detect issues such as fraud risks (ISA 240) and to report the findings to relevant stakeholders (DeAngelo, 1981; De Fond and Zhang, 2014).

Finally, it appears that the explosion of BDA tools in BD environments has also seen an increasing relevance of artificial intelligence (AI). Audit firms make claims on areas of AI, such as machine learning and blockchain accounting. Both areas could have an impact on how audits will be performed in future and could also shape our understanding of auditing in data driven environments. For instance, EY has developed a proprietary blockchain technology called Analyzer which is being piloted among audit teams. The technology allows audit teams to perform in depth review of business transactions using Cryptocurrencies (EY, 2018). Given that audit firms are making investments in these areas, it could be interesting to find out how these two areas are related to BDA and the social relevance of auditing.

### 8.5 Conclusion

This study has essentially investigated the conduct of financial statement audits in BD environments. In particular, it has explored the recent innovation in auditing called BDA and its implications. The aim of the study has been to understand how this technology (BDA) is used in data driven environments to maintain the social relevance of auditing. To this end, the study has focused on two aspects: the promotion of BDA in the audit field and its embedding in the audit process. It has shown that audit firms are key players in the maintenance of the social relevance of auditing because they draw on technologies that are prevalent in the business environment at a particular point in time to construct narratives, identities and insights that position auditing within the organisation, and with respect to the regulation of clients and the social environment.
BDA provides an opportunity for audit firms to claim the provision of credible audits by drawing on vocabularies and knowledge from the field of data science. Using such knowledge and vocabularies, they seek legitimacy with regulators and clients for BDA and auditing in a data driven environment. Similarly, the embedding of BDA requires more than just the changing of practices; it also requires the reconstruction of auditors’ identities to resonate with BDA. In this regard, auditors are required to interpret large sets of data, to uncover insights and to be able to use powerful visualisation tools to communicate effectively with their clients and regulators. The study also shows that the properties of BDA are crucial in the process of maintaining social relevance because they can either influence or limit what auditors can do. In essence, BDA enables audit firms to address their regulatory requirements and to also remain competitive as businesses.
APPENDIX

1: Interview Schedule and Key Questions

INTRODUCTORY PHASE (PILOT STUDY and MAIN INTERVIEWS)

All participants
Introducing myself.
Introducing the nature of the research project.
Stating the confidentiality issues including asking permission to record the interview.
Gathering personal information
Could you please state your role in this organisation and how it is connected to Big Data and Analytics?
How long have you been in this organisation?
How long have you been dealing with Big Data Analytics?

PILOT STUDY

All participants
Could you explain your understanding of Big Data?
In what context is Big Data related to your organisation?
How are Big Data Analytics developed?
What is the difference between Big Data and Big Data Analytics?
What are the key developments of Big Data Analytics in your organisation and business in general?

Audit partner only
How is Big Data related to auditing?
Are there changes in your audit firm in relation to Big Data or Big Data Analytics?
What is the difference between analytical tools now and the ones you used in the past?
What are the opportunities/ challenges associated with using Big Data Analytics?
MAIN INTERVIEWS

Audit firms

Promotion of Big Data Analytics

What is Big Data Analytics and its role in the context of auditing?

Describe how you are developing Big Data Analytics in your organisation?

How are you introducing Big Data Analytics to clients?

What is influencing the use of Big Data Analytics?

How are other stakeholders feeling about your use of Big Data Analytics in audits of financial statements?

Embedding of Big Data Analytics in Audits of Financial Statements

How do you feel now about using Big Data Analytics in audits?

In which areas are you required to use Big Data Analytics?

How are you encouraged to use Big Data Analytics?

Has your role changed or do you expect it to change as a result of using Big Data Analytics?

What are the challenges you are facing in using Big Data Analytics?

Properties of Big Data Analytics

How does Big Data Analytics enable you to perform audit procedures?

Would you please show me how this is done?

How are the properties of Big Data Analytics different from the analytical tools you used to have?

What are the challenges you face when using functionalities embedded in Big Data Analytics?

Implications from an audit firm as a multi-disciplinary work environment

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Where does the audit function sit within the organisation in relation to Big Data Analytics?
Describe the benefits/challenges of working with other functions within the firm which are also using Big Data Analytics.
What is your relationship with regulators regarding Big Data Analytics?

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<th>Regulators</th>
<th>Implications of Big Data Analytics for audits</th>
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<td>Describe Big Data and Big Data Analytics from your perspective?</td>
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<td>How is Big Data Analytics affecting the way you regulate external audits?</td>
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<td>What are the benefits / challenges associated with Big Data Analytics?</td>
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<td>How are you working with relevant stakeholders on Big Data Analytics?</td>
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<th>Standard setters</th>
<th>Implications of Big Data Analytics for auditing standards</th>
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<td>Describe the developments taking place in your organisation in relation to Big Data Analytics</td>
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<td>What are the benefits / challenges associated with Big Data Analytics?</td>
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<td>What are the plans of IAASB in relation to Big Data Analytics and incorporating it in auditing standards?</td>
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<th>Follow-up interviews</th>
<th>Clarification of findings .</th>
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<td></td>
<td>Asking if anything has changed since the last meeting .</td>
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