

**Gordon Institute
of Business Science**
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Big data adoption in SMMEs

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Abstract

Big data and the use of big data analytics is being adopted more frequently, especially in large organisations that have the resources to deploy it. Big data analytics is allowing businesses to optimise operations and gain deeper insights into their customers' needs and behaviours. There is, however, almost no published research into how big data analytics is being used by SMMEs and how they are doing this despite having constrained resources.

The objective of this research was to explore the factors that contribute to the adoption of big data analytics in SMMEs. Nine qualitative, semi-structured interviews using the long interview method were conducted with respondents who worked in senior management positions in SMMEs that were using some form of big data analytics. Eight of these respondents were at EXCO level, seven had some level of business ownership and five were the Managing Directors of the organisation.

The study found the use of evidence in decision-making and entrepreneurial orientation to be present. These organisations are both proactive and innovative, and limit their risk by the use of experimentation. This provides insights into how these companies develop novel business models through the use of cloud services and by providing the ability to digest and analyse data on their client's behalf. A framework is proposed and adapted. Suggestions for future research and limitations of the study are presented.

Keywords

big data, evidence-based, entrepreneurial orientation, small business, SMME

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other university. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Gregory Justin Potter

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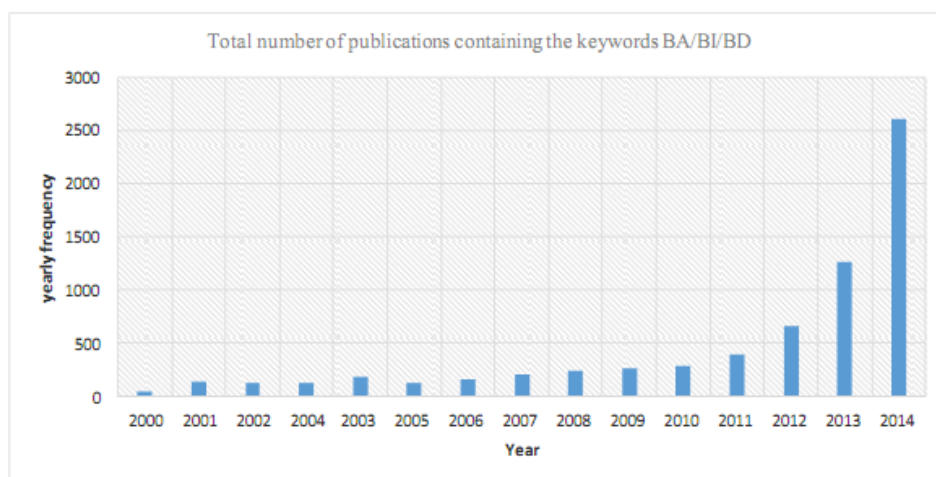
Chapter 1: Introduction to Research Problem

“Data is the new oil” – Ann Winblad (Rotella, 2012)

Recent media articles on how small businesses can embrace big data (Schloss, 2014) and tips for small businesses on big data (Fallon, 2014) claim that the time is right for small businesses to start looking at using big data analytics. A survey paid for by one of the largest big data tool vendors, SAP, found that it is easier than ever for small business – which has been left out of the oil rush because of lack of available resources – to engage with their offerings and tools sets (SAP, 2012). It would appear that as more online tools and technology solutions such as cloud services and Google Analytics become available, the barriers to adopting big data analytics are steadily dropping.

The academic interest in business analytics, and big data in particular, has recently shown a marked increase, as can be seen in Figure 1.1 below. The number of academic articles published on this topic in the last three years is evidence of this increase in interest in business analytics. As the author of the bibliometric survey stated, “BA/BI/BD capabilities, applications, and tools have emerged as one of the fastest growing fields in recent years” (Bayrak, 2015, p. 234).

Figure 1.1 – Number of publications containing the keywords “business analytics”, “intelligence” and “big data” (Bayrak, 2015)



Recent articles express the benefits of big data and the success that large businesses have had by leveraging it to improve their decision-making process. In addition, this has also led to improved tailoring of their new product and services offerings (Davenport, 2013; McAfee & Brynjolfsson, 2012). In some cases, these new entrants used insights

gleaned from big data analytics to create a compelling customer value proposition that the incumbent businesses could not match. For example, Netflix's investment in the production of a complete season of an unpiloted series was based on their analysis of their customers' viewing habits and rating data (Kumar & Purkayastha, 2013). This data gave Netflix a competitive advantage and insight – to which other Hollywood production companies did not even have access. This was considered the game changer (Kumar & Purkayastha, 2013). These examples are, however, largely anecdotal and case-based, which leaves a research gap as to exactly how big data could help improve firm performance (Bøe-Lillegraven, 2014). The examples these articles provide are all focused on the successes of big businesses such as UPS and Walmart, with no examples of small business given.

The original pioneers of big data – companies like Google, Facebook, Yahoo and LinkedIn – all started out as technology start-ups that used data provided to them by their users through the internet as the engine of their growth. These companies built the culture of their business around the use of data to make better quality decisions and they have found ways of monetising the data which they have collected internally (McAfee & Brynjolfsson, 2012). This culture of “evidence-based decision-making” is cited as being crucial for a company to be successful in adopting big data analytics (McAfee & Brynjolfsson, 2012; Ross, Beath, & Quaadgras, 2013).

Given the entrepreneurial tendencies of the leaders of small business, their reputation for being agile and their ability to exploit niche markets, it seems logical that small business would be ideally suited to take advantage of the opportunities that big data analytics could help them identify. This raises some questions:

- Do small businesses that are successfully using big data analytics have a culture of making decisions based on evidence?
- Is there evidence that an entrepreneurial culture would support the adoption of big data analytics?
- Has the availability of online tools and cloud services reduced the barriers to entry for businesses with constrained resources?
- If they are active, what are small businesses using big data analytics for?

Despite the increase in the number of articles published focusing on big data, it appears that none deal with how small business should go about using big data analytics or what factors will determine whether they will be able to so. A meta-review of all the articles returned by searching for “business intelligence”, “business analytics” and “big data” on seven of the well-known research databases ranked the top fifteen occurrences of both topic and discipline (Bayrak, 2015). The top four in both instances were “computer science”, “business and management”, “engineering” and “economics”, but neither “small business” nor “entrepreneurship” was mentioned in either list. The researcher’s own review of the literature on electronic sources such as EBSCOhost, Emerald and JSTOR did not reveal any research on big data, decision-making and small businesses. This suggests that the current practice of decision-making using big data analytics in small business is relatively unknown and that there is a need for research in this area.

It is a generally accepted fact that small and medium enterprises (SMEs) are important contributors to the global economy. In developing countries such as Chile and Malaysia, SMEs make up the bulk of the country’s employers (Cheng, Kadir, & Bohari, 2014; Timm, 2012). In South Africa, 90% of all new jobs created between 1985 and 2005 were by SMEs (Timm, 2012), and SMEs also created 15 times more jobs than big businesses (Williams, 2012). This means that South Africa is going to need SMEs to meet the government’s stated target of creating 11 million new jobs by 2020 (National Planning Commission, 2013). The South African government has identified broadband internet access as a means of supporting a knowledge economy, which it hopes will drive the creation of jobs (Carrim, 2013). If entrepreneurial South Africans are able to improve their decision-making by using big data analytics or if they are able to identify opportunities to build business around the use of data, then this will contribute towards realising the vision of the National Development Plan.

The approach of this research was to first review the available literature on culture, decision-making, entrepreneurship and big data and to identify if there were any references that could help with answering the above research questions. Three research propositions were developed based on the available literature and, given that this is demonstrably a new area of research, it was decided that a qualitative, exploratory research method was the most appropriate. Semi-structured interviews with leaders of small businesses using big data were used. Following the data collection, the interview transcripts were analysed and coded for the themes identified, as well as for any new

information that the respondents raised. The findings have been presented and are interrogated against the available literature, followed by a discussion of the possibilities for future research and the implications for managers.

It is hoped that this research will provide some insight for small business leaders who are not yet using big data when looking at their own organisation to assess whether it would be appropriate for them to do so. Adopting new technologies involves an element of risk and investment, and the researcher's view is that the decision to make that investment should look not only at the costs, but also at the ability of the organisation to make the changes necessary to adopt that technology. In addition, it is possible that larger organisations can look to learn from smaller companies who operate under resource constraints and who therefore have to be more creative with their approach to big data.

Chapter 2: Literature Review

2.1 Introduction

The main objective of this research was to try identify which factors small businesses should consider when looking to adopt big data analytics. Small business, with its typically entrepreneurial leaders, has a reputation for being more agile and better at exploiting niche markets than its larger counterparts. Furthermore, despite constrained resources, small business would seem to be ideally suited to take advantage of the opportunities that big data analytics would help identify. However, there is also the general assumption that small business managers would be more likely to rely on their intuition when making decisions, as it is assumed that they do not have the time or sources of information needed to make more rational decisions. How do the managers of small businesses that have adopted big data then manage to balance this dichotomy of taking the time needed to find and consider the evidence with responding to the pressures of their environment and allocating their scarce resources?

In view of the fact that no published research on the use of big data in small business could be found, as evidenced in Chapter 1, the researcher surveyed the literature available on big data analytics. Following the identification of shared elements from the literature streams of culture, decision-making, entrepreneurship and small business, a conceptual model was developed for the purpose of researching the adoption of big data in small businesses. A discussion of the conceptual model follows.

It should be noted that the terms “small business” and “SMMEs” (Small, Medium and Micro-sized Enterprises) may be used interchangeably in this literature review and must be taken to mean the same thing, as recommended by the South African Department of Trade and Industry in their Annual review of small business in South Africa 2005–2007 (2008).

2.2 Conceptual model

The researcher created a conceptual model based on the available literature to help contextualise the research. In addition, the model is intended to provide continuity between the literature review, the research propositions and the findings. The conceptual model was constructed based on five key arguments. The first three are categorised as “behavioural” as they relate to the influence of the founder / MD / top management team on the culture within the organisation:

- 1) The MD and the top management team have a strong impact on the performance of their organisations and this has been attributed to their influence on the attitudes and behaviours of their employees (Eisenhardt, 2013; Wang, Tsui, & Xin, 2011), in other words, through the organisation’s culture. Organisational culture includes the artefacts, basic assumptions, values and norms shared by the organisation’s members (Cummings & Worley, 2014, p. 552) or, simply put, it is “the way we do things around here” (attributed to Bower, 1966). The influence of the MD and top management on the culture in small organisations would be magnified as there are fewer layers between the employees and the leaders, and in really small organisations there would be almost none. The founder is also identified as being instrumental to the creation and perpetuation of the organisational culture (Robbins & Judge, 2012; Schein, 1983) and if the founder remains within the business, especially in the role of MD, their role in the organisational culture and its link to driving firm performance would be much more pronounced. Given the level of influence of the founder, MD and top management teams in small businesses, it can be argued that their own individual approaches to tactical and strategic decision-making, and their own entrepreneurial approach, would then be embedded in the business through their influence on the organisational culture.
- 2) There is general agreement in the literature that approaches to decision-making fall into two camps, namely 1) those that are rational in that they follow a process of logic and base their decisions on facts and figures; and 2) those decision makers who rely on their own intuition and gut feel (Robbins & Judge, 2012). Small business managers have to make decisions across a broad range of functional areas, often without the specialist knowledge required and in a context of constrained resources (Nieman, 2006; Stokes & Wilson, 2010). It has been suggested that some entrepreneurs may over time learn to adapt and base the approach they apply on the context of their situation (Haynie & Shepherd, 2009). Furthermore, an individual’s preference for either an intuitive or more rational

approach may affect their own view of their effectiveness at different stages of the business venturing process and they are more likely to rely on their preference at a particular stage (Kickul, Gundry, Barbosa, & Whitcanack, 2009). Therefore, the cognitive preference of the founder / MD / top management team in the context of the elements of culture discussed in point 1 above will determine the decision-making culture of the organisation. In terms of this research, it is necessary to understand the leadership's cognitive preference in order to determine if a rational (evidence-based) decision-making culture encourages the adoption of big data, as suggested by McAfee and Brynjolfsson (2012) and Ross et al. (2013).

- 3) The strategic decision-making processes of an organisation can be considered through the lens of the entrepreneurial orientation (EO) of an organisation (Lumpkin & Dess, 1996), and by extension that of its founder / MD / top management team in a small business context. This specifically pertains to the organisation's proactiveness in scanning its environment for new opportunities, the innovativeness with which it combines its scarce resources to meet those opportunities and its propensity to engage in risk-taking (Lumpkin & Dess, 1996; Rauch, Wiklund, Lumpkin, & Frese, 2009; Wiklund & Shepherd, 2003). The literature has suggested that the element of proactiveness, specifically through the acquiring and utilisation of information as evidence in its decision-making about changes in the organisation's environment, is particularly effective when combined with innovation (Hughes & Morgan, 2007; Keh, Nguyen, & Ng, 2007; Wiklund & Shepherd, 2003). Risk-taking, however, presents a double-edged sword as, while it has been linked through EO as an element that contributes to a firm's success, it may be responsible for a firm's failure as well. This is an acknowledgement that EO research may display an element of survivor bias (Wiklund & Shepherd, 2011). It is argued that big data analytics could provide decision makers with a valuable source of information on their organisation's external environment. Those firms that are proactive, innovative and risk-taking are more likely to make the necessary investment in new technologies and use that information to identify and exploit new opportunities.

Given that small business is generally considered to be resource constrained, the context of the resources available in a small business must also be considered:

- 4) The combination of the tangible and intangible resources of an organisation in a novel and innovative way which cannot be easily copied by their competitors gives an organisation competitive advantage (Barney, 1991). The dominant view

of competitive advantage is that of resource-based theory (Wiklund & Shepherd, 2011). Given the constrained resources of small businesses, it is contended that the available tangible resources, in the form of financial and technological capital, and intangible resources, in the form of the skills and knowledge of their human resources, must be taken into consideration when looking to exploit a new opportunity or technology. This is because for every resource that is consumed there is an opportunity cost that must be considered when making decisions. Realisation of opportunities for small business therefore takes place within in a far more constrained environment than that of big business. Nevertheless, there is a school of thought which says that being entrepreneurial means that an opportunity must be pursued despite the lack of resources, and the ability to leverage external resources is one of the hallmarks of the entrepreneur (Stevenson & Jarillo, 1990; Stokes & Wilson, 2010).

The increased number of free analytical tools on the internet, such as Google Analytics, and the advent of cloud services, which is a pool of shared computing resources that can be very quickly setup and configured (Delen & Demirkan, 2013), suggests that tangible resources may become less of an issue. However, the intangible specialist human resource skills and knowledge are still a factor as the so-called data scientists (Davenport & Patil, 2012) needed to process complex information sources and help identify commercial opportunities are still scarce. Data scientists are therefore a competitive advantage for those organisations that have them. It is consequently argued that the context of the organisation and its available resources is also germane to its ability to adopt and make use of big data analytics.

Finally, there is the understanding of the topic of big data itself.

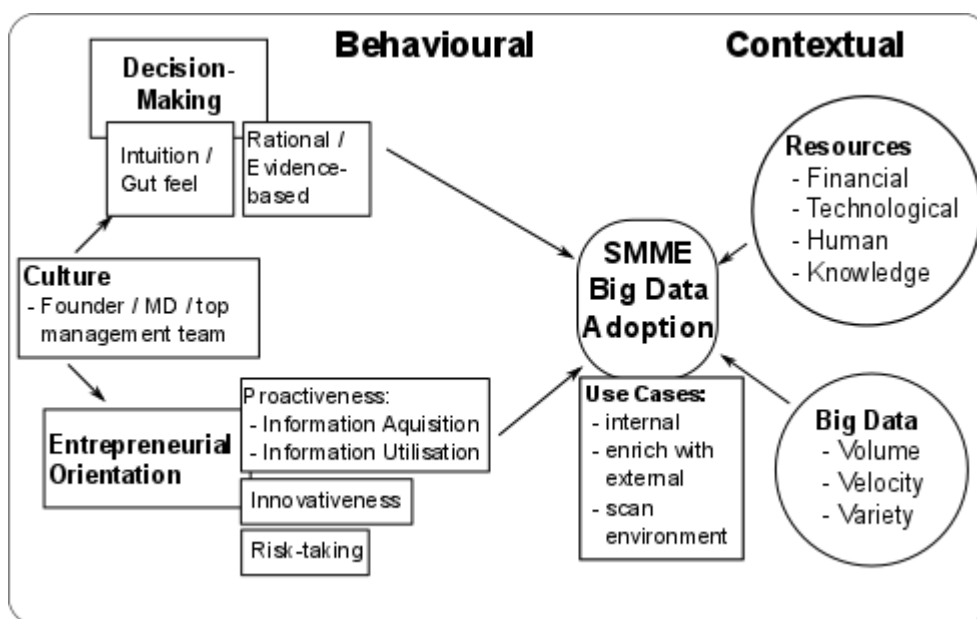
- 5) The so-called three Vs, namely volume, velocity, and variety are what separate big data from small data (Jagadish et al., 2014) and an understanding is necessary of what role big data analytics can play in an organisation's tactical and strategic decision-making. Anecdotal evidence (Davenport, Barth, & Bean, 2012; Davenport, 2013, 2014; McAfee & Brynjolfsson, 2012) suggests that large organisations are using big data analytics to:
 - a. Process large internal data sources to extract operational insights and improve profitability by reducing costs;
 - b. Enrich their internal data sources using data sourced externally to improve their decision-making; and

- c. Scan their environment to better understand their industry and their competitors – what their customers are saying about them and their competitors and to help identify opportunities that they can exploit.

The question can therefore be asked: are small organisations following the lead of large organisations, or have they identified some other niche or mechanism to overcome their resource context?

In summary, it is submitted that the ability of a small business to adopt big data analytics may be understood by looking at the role of the founder / MD / top management team in determining the organisation’s decision-making and entrepreneurial culture, and how those leaders are deploying their scarce resources to engage with and make use of big data analytics in their businesses. The key arguments made above and the elements identified during those arguments are summarised in the representation of the constructed conceptual model in shown Figure 2.1.

Figure 2.1 – Conceptual model of factors that influence big data adoption in SMMEs



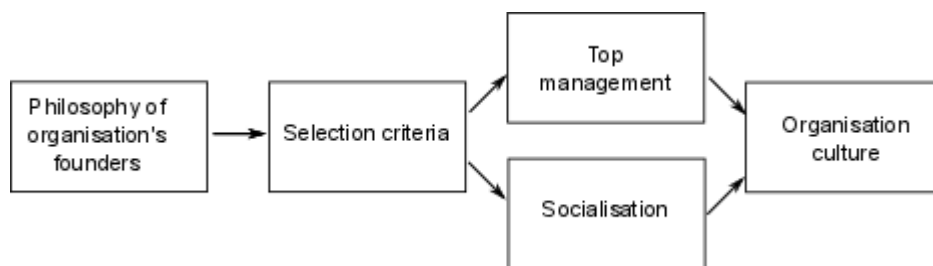
Next, the literature on the elements of culture, decision-making, entrepreneurial orientation, resource context and big data will be considered individually.

2.3 Culture

Organisational culture includes the artefacts, basic assumptions, values and norms shared by the organisation members (Cummings & Worley, 2014, p. 552) and is described as the rules of the game (Robbins & Judge, 2012, p. 550). In other words, how the members of the organisation interact and relate to one another and how they are expected to act. Culture originates with the founder when the organisation is originally

incorporated (Schein, 1983) and is maintained through both the selection and socialisation processes used to identify, select and train new staff (Robbins & Judge, 2012). In this way, the founder ensures that their view of the world and their way of doing things remain dominant within the organisation. Once an organisation grows in size, the top management team also has a high level of impact on organisational culture as, through their words and actions, they demonstrate to their staff what actions and behaviours are the norm (Robbins & Judge, 2012, p. 554). New staff, upon arrival, will very quickly realise the difference between their own personal values and norms and that of the organisation, and are socialised to conform to the accepted norms and values (Robbins & Judge, 2012, p. 554). Otherwise, by implication, they will reject the company culture and end up leaving. This process of how an organisation's culture is formed, maintained and passed on to new staff is illustrated in Figure 2.2.

Figure 2.2 – How organisation cultures form (Robbins & Judge, 2012, p. 557)



Research conducted on the role of the MD in influencing firm performance found that, while their task-focused behaviours have a direct impact, the MD is also able to influence the attitudes of their staff. This in turn impacts on organisational performance both directly and indirectly (Wang et al., 2011). Eisenhardt (2013) provides evidence that the top management team is central to the performance of entrepreneurial firms through their approach to strategic decision-making (p. 807). This evidence from the literature provides additional support for the contention that the decision-making culture of a small business will be strongly influenced by the founder / MD / top management team's preferred method of decision-making and that new entrants to the business will be inducted into that preferred decision-making culture. If this culture is one that supports making decisions based on evidence, then it increases the likelihood that the business will successfully adopt big data analysis. If not, then changing the culture of the organisation can be extremely difficult, as it is internalised by the members of the organisation and is most strongly reinforced by the unspoken assumptions that employees have accepted as reality (Cummings & Worley, 2014; Schein, 1984).

Schein (1984), whose work is frequently cited in the literature regarding organisational culture, suggests that culture should be observed at multiple levels within the organisation, namely:

- 1) artefacts – visible evidence of culture in the form of documents and physical environment;
- 2) espoused belief and values – those values that the organisation members claim as important; and
- 3) the underlying assumptions – those beliefs and values taken for granted that actually determine behaviour in an organisation (pp. 1–2).

Despite being over 30 years old, Schein’s model is still widely used in the literature, for example, in linking organisational culture, innovation and firm performance in a recent study by Hogan and Coote (2014), suggesting that it is still an appropriate lens through which to study the culture of an organisation. We therefore now turn to how small organisations make decisions with the understanding of the great influence of the founder and the cultural forces within SMMEs.

2.4 Small business decision-making

It is argued that a business with a clear understanding of the market in which it operates, who its customer are, what they need and how it can best meet that need will perform better than a competitor who lacks the same level of knowledge or insight. Two studies were found which looked at the use of marketing metrics and linked that metric use in making decisions to increased firm performance (Keh et al., 2007; Mintz & Currim, 2013). Keh et al. (2007) looked at the effect of entrepreneurial orientation (EO) on the use of marketing metrics and firm performance in SMMEs and found evidence that it increases firm performance. This supports the contention made in the conceptual model that EO can be applied to the use of metrics (a core component of big data use) in the small business context, and that higher levels of EO in an organisation contribute to firm performance. Mintz and Currim (2013) developed a conceptual model that proposes a number of drivers of the use of both marketing and financial metric use in organisations. In testing the model, Mintz and Currim’s (2013) primary finding was that the use of financial and marketing metrics by the managers surveyed in the study is not determined by the managers themselves, but rather by other variables that affect the context within which the manager makes the decision. This supports the inclusion of the decision context in the conceptual model above.

This context included variables such as:

- the firm's strategy (defenders, analysers or prospectors);
- the firm's characteristics (organisation size, type of ownership and a focus on business-to-business (B2B) or business-to-consumer (B2C)); and
- environmental characteristics (market conditions and industry specifics).

Mintz and Currim's (2013) secondary finding was that the use of marketing metrics is positively associated with marketing mix performance, a finding that supports the study by Keh et al. (2007). The findings of Mintz and Currim (2013), while not focused on small business, included a number of small businesses in the study sample and highlighted the organisation's size in their discussion of the firm's characteristics. This suggests that elements of their model are relevant to small business and the model could therefore be used when considering questions to ask while drafting the interview guide, as well as during the analysis of the results of the research.

Having established that the use of metrics could have a positive effect on small business performance and that the context in which a manager is making their decision affects their use of metrics, it is necessary to consider the particular situation and context of the small business manager.

2.4.1 Availability of resources and the relevance of context

Mintz and Currim (2013), in conceptualising their model, suggested that the firm's characteristics should be viewed through the lens of the resource-based view. The term resource-based view (RBV) was coined by Wernerfelt (1984), who made the contention that it is more important for a firm to concentrate on their resources than on their products. RBV has since evolved into resource-based theory (RBT) as it has matured as a concept (Barney, Ketchen, & Wright, 2011). As such, the terms RBV and RBT essentially mean the same thing. From its original base, RBV was developed further by Prahalad and Hamel (1990) into a focus on the core competencies of the organisation and by Barney (1991), who developed the characteristics of what makes a resource a source of competitive advantage, which is valuable, rare, inimitable and non-substitutable. Resources in an organisation can take the form of both tangible and intangible assets, including the financial and technological capital, the human resources, the organisation's management skills, its processes, and the information and knowledge, including the data sources which are controlled by the firm. These resources must be considered when making decisions (Barney et al., 2011). Small businesses are generally recognised as being resource constrained in some form. It can therefore be argued that

the tangible (financial and technological) and the intangible (human and knowledge) resources need to be considered by the managers in small business when making decisions, and have therefore been included in the conceptual model.

The second lens used by Mintz and Currim (2013) was that of contingency-based theory. As when considering the environmental characteristics or context of the situation, they argue that these characteristics will affect the “manager’s priorities, abilities and need for information” (p. 23) when making decisions. It is therefore arguable that not all decisions are equal and, depending on the context of the decision and the types of information or data available, the small business manager may choose to apply different approaches to making decisions. At its most fundamental level, decision-making requires an individual to make a choice between two or more alternatives. How an individual goes about making that decision ranges from a rational or analytical approach to relying on intuition and gut feel.

2.4.2 Rational versus intuition-based approach to decision-making

The rational model asserts that the best decisions are made by rational individuals who seek to maximise their outcome after having considered all available alternatives (Robbins & Judge, 2012), in other words, making the best decision based on the evidence available. This approach assumes that all individuals are rational (not affected by their emotional state), have all the relevant information available to them and have sufficient time in which to consider all the alternatives (Robbins & Judge, 2012). However, decision makers seldom have enough information, or are simply overwhelmed by the number of factors involved and seek to simplify the problem. They may also simply look for easy alternatives that satisfice - or satisfy and suffice, rather than invest time in looking for the best alternative (Robbins & Judge, 2012). This is known as bounded rationality (Robbins & Judge, 2012), a model which acknowledges the cognitive shortcomings of the decision maker (Rahman & De Feis, 2009). The risk of this approach is that while the decision maker may lead themselves to believe that they have made the right decision, they may in fact be biased. Biases manifest when the decision maker only considers available evidence, looks for evidence that confirms their beliefs or focuses on one aspect of the evidence and discounts the rest (Robbins & Judge, 2012).

Tversky and Kahneman’s (1974) seminal article provides a full description of the types of heuristics and biases that may be employed in individuals’ decision-making. Heuristics are basically simplification strategies that help the decision maker to reduce the

complexity of the decision they are faced with, especially when time is a factor and there is little information available (Alvarez & Busenitz, 2001, p. 758). There is some evidence that suggests that entrepreneurs make use of heuristics in their decision-making (Alvarez & Busenitz, 2001; Busenitz & Barney, 1997; Eisenhardt, 2013). It is argued that this lack of information could potentially be solved (at least partially) by the use of big data analytics. An example of a heuristic process given by Eisenhardt (2013) was that a particular management team had a simple rule that they only entered English speaking countries (p. 811). These simple rules, while effective, are different from intuition. Dane and Pratt (2007) describe intuition as an unconscious process that occurs rapidly and is affected by the emotions of the decision maker. The literature suggests that intuition may be favoured as a decision-making model because of its speed and the apparent ease of allowing the subconscious mind to make the decision (Betsch & Glöckner, 2010; Sadler-Smith & Shefy, 2004) and that it may be beneficial in situations where the decision maker is faced with a lack of resources (Miller & Ireland, 2005).

This apparent preference for heuristics and intuition when faced with complex situations and scarce resources illustrates the dichotomy that may exist in small businesses. Understanding how small business managers using big data are balancing this dichotomy is an essential part of this research, as adopting evidence-based decision-making in a business is acknowledged as being difficult (Pfeffer & Sutton, 2006). A manager's job is made more complex by the wide variety in the age, size, resource availability and competencies of the business (Pfeffer & Sutton, 2006). There is often too much evidence, or there is not enough good evidence, or the evidence does not quite apply, which causes managers to distrust the findings over their own experience. This is supported by the study done by Francis-Smythe, Robinson and Ross (2013), who found that intuitive methods and a reliance on experience were preferred by the general managers who were surveyed. Francis-Smythe et al. (2013) focused on larger businesses and specifically limited their sample population to organisations with more than 200 employees

Turning to small business, in a review of the last forty years of literature on the roles of cognitive style (analytical versus intuition), Armstrong, Cools and Sadler-Smith (2012) considered the evidence found by studies which focused on entrepreneurial decision-making. They found that while there is evidence that entrepreneurs appear to differ from managers in large organisations, the results were not completely consistent across all

studies. Some research suggests that entrepreneurs show a balance between intuition and analysis. The conclusion by Armstrong et al. (2012) was that different cognitive styles were likely to be appropriate to different phases of business venturing, which implies that the entrepreneur may be comfortable to choose a style appropriate to the situation at hand. This may make them better suited to unlock the opportunities that data may present to them. This contradicts the general assumption that, given the resource constraints faced by the managers of small businesses, they would be more likely to use intuition for its aforementioned speed and apparent ease. If small business managers are willing to invest the additional time and effort into a rational decision-making method like evidence-based decision-making at the appropriate phase of business venturing, then this bodes well for the adoption of big data in small business.

Having considered the differences in the approaches to decision-making found in the literature, we now turn to a specific rational decision-making model called evidence-based decision-making. This is an approach that has been identified as necessary for the successful adoption of big data in organisations (McAfee & Brynjolfsson, 2012; Ross et al., 2013).

2.4.3 Evidence-based decision-making and big data

Evidence-based decision-making is the practice of basing decisions on evidence that is either found in research literature or obtained locally by the decision maker, with the goal of improving the outcome of the decision to be made (Rousseau, 2006). Evidence-based decision-making rose to prominence in the field of medicine as a means of improving patient care and helping doctors to make better decisions (Walshe & Rundall, 2001). Evidence-based management (EBMgt) is a set of management practices that includes evidence-based decision-making (Briner, Denyer, & Rousseau, 2009; Pfeffer & Sutton, 2006). The terms are sometimes used interchangeably, but essentially revolve around the same basic concept.

Rousseau (2012) provided an updated definition for evidence-based management (EBMgt) as:

*“EBMgt combines four fundamental practices in making every day managerial judgments and decisions: (1) use of the best available relevant scientific findings; (2) systematic attention to **organisational facts, indicators, and metrics** [emphasis added]; (3) ongoing practice of critical, **reflective judgment, and use of decision aids in order to improve decision quality** [emphasis added]; (4) consideration of ethical issues, in particular, the impact of decisions on their many stakeholders.”* (Rousseau, 2012, pp. 4, 5)

The relevance of evidence-based decision-making to big data comes in the form of practice two and three, namely the attention to organisational indicators and metrics and

the use of decision aids to improve decision quality, which can be provided in abundance by big data sources and analytics on big data. It is submitted, therefore, that there is no point for an organisation to adopt big data analytics if they are not going to make use of the evidence provided to improve the effectiveness of their decisions.

Despite early criticism in the literature (Learmonth, 2006, 2008; Reay, Berta, & Kohn, 2009), it would appear that evidence-based decision-making and evidence-based management are gaining acceptance. A recent special issue of the journal *Entrepreneurship Theory and Practice* focused on evidence-based entrepreneurship, which emphasises “the science informed practice of entrepreneurship...[which] builds on insights from the related practice of EBMgt” (Frese, Rousseau, & Wiklund, 2014, p. 209). The authors continued by saying that they recommend that entrepreneurs use the data that they already have in their organisations to enhance their practice, as there is a reciprocal link between entrepreneurial action – which is to act on an opportunity that has been identified as worth pursuing (McMullen & Shepherd, 2006) – and environmental feedback (Frese et al., 2014). They present Google as an example of a firm that has grown considerably on the basis of an “empirical approach” and who have used their own internal data to improve their marketing and management decisions (Frese et al., 2014, p. 214). This concept of evidence-based entrepreneurship in the literature provides further support for the argument made in the current research that evidence-based decision-making is an important component in the use of big data in small business, and that entrepreneurs in those small businesses will benefit from the use of big data analytics to scan their environment in a myriad of ways. It is for this reason that it was included in the conceptual model as one of the potential use cases of big data in small organisations.

2.4.4 Environment scanning and strategic decision-making

Environment scanning is described as the acquisition and use of information about the external environment that affects a business, such as current trends and events that may bring about changes to their environment when making strategic decisions (Rahman & De Feis, 2009). It is particularly useful in scenarios where the decision maker is faced with high levels of both complexity and time pressure (Rahman & De Feis, 2009). Earlier research suggests that small businesses are better at scanning and understanding their external environment than their counterparts in big businesses (Johnson & Kuehn, 1987), which may be part of the reason why they are so often described as being able to exploit niche markets.

Environment scanning and its role in strategic decision-making would appear to have originated from work done by Aguilar (1967), who suggested four elements to consider when making strategic decisions, which have been developed further in the well-known PESTLE model. Environmental scanning also echoes the work of Ansoff (1975) on the need for businesses to listen to weak signals in their environment. Another well-known strategic decision-making model is Porter's (2008) five forces. This model suggests that businesses need to understand the industry in which they operate in order to succeed. Organisations need to identify who their competitors, suppliers and buyers or customers are. They also need to identify which companies are trying to enter their industry and what substitutes exist for their products or services that may affect their share of the market. These approaches both require the organisation to acquire information about their external environment and their industry. It can therefore be argued that environment scanning and the five forces model can be used when considering which questions to ask when constructing the interview guide.

It is contended that environmental scanning and its focus on acquiring and using information can be linked to the work of Keh et al. (2007), who looked at entrepreneurial orientation, information acquisition and utilisation and the use of marketing metrics in SMMEs, and as such the focus turns to entrepreneurial orientation.

2.5 Entrepreneurial orientation (EO)

2.5.1 Understanding what EO is

EO is defined as the "policies and practices that provide a basis for entrepreneurial decisions and actions" (Rauch et al., 2009, p. 763). The most commonly identified and used dimensions of EO in the literature are innovativeness, risk-taking and proactiveness. These dimensions originated from work done in the late 1990s to the early 2000s, which focused on the entrepreneurial orientation of organisations while trying to establish a link to organisational performance. Examples of these include work by Covin and Miles (1999), Lumpkin and Dess (1996, 2001) and Wiklund (1999). The most commonly referenced definition for these three elements in the literature is based on the work by Lumpkin and Dess (1996, 2001).

Innovativeness is defined as the firm's willingness to engage in and support new ideas, experimentation and creative processes that lead to new products and services (Lumpkin & Dess, 1996). Innovativeness also describes the willingness of the business to

introduce novelty technological leadership in developing new processes (Lumpkin & Dess, 2001). This definition supports a contention that innovativeness will be a key indicator as to whether a business will adopt big data.

Risk-taking is the tendency to take bold action and commit resources in the face of uncertainty (Lumpkin & Dess, 2001). It is argued that organisations with a higher risk appetite will be more likely to invest in the technology needed to use big data. However, this element comes with a caveat, as decisions that involve risk-taking have to be balanced against the allocation of scarce resources, which could have been put to other uses, and may therefore increase the chance that a business will fail (Rauch et al., 2009).

Proactiveness is a forward-looking perspective that suggests that companies with a high level of EO will be looking to be the first to market capture a particular segment and act in advance in anticipation of future demands (Lumpkin & Dess, 2001). It is argued that proactive organisations can make use of big data analytics to improve their understanding of their customer and their industry, with the proviso that they have access to the right sources of information. It is therefore an important element to consider when looking at big data adoption in small business.

2.5.2 EO, information acquisition, information utilisation and SMMEs

Keh et al. (2007) researched the effects of entrepreneurial orientation (EO) and the use of marketing information on the performance of SMEs and found that:

- EO affects the acquisition and utilisation of marketing information, and has a direct effect on the performance of the organisation; and
- The utilisation of information regarding marketing mix decisions, commonly known as the 4Ps, also positively affects the performance of the organisation.

Keh et al. (2007) stated that information acquisition (IA) is concerned with the tendency of organisations with high levels of EO, specifically the element of proactiveness, to constantly scan and monitor their environment for information that will help them identify opportunities, and ways to strengthen their competitive positions (Covin & Miles, 1999). However, purely acquiring the information is not enough, as it is the actual use of information, termed information utilisation (IU), that has a positive effect on the organisation's performance (Keh et al., 2007). Lau, Liao, Wong and Chiu (2012) argue that the growth of the internet and the availability of online resources has meant that online environmental scanning has become more popular. However, it is not practical for

top management to do the scanning themselves as they are likely to become overloaded by the sheer volume of information, which means that big data analysis is required to help them handle the volume. It is logical, therefore, that an organisation's propensity to scan its environment would be linked to its desire for sources of external information on its environment, and that big data can be used to process and analyse the vast volumes of online information.

The literature suggests that IU, or the use of evidence when making decisions, has a positive effect on firm performance and that EO is a useful lens through which to consider the use of big data in small businesses. The literature also supports the contention made by McAfee and Brynjolfsson (2012) and Ross et al. (2013) that a culture of evidence-based decision-making is required for the successful adoption of big data in an organisation. It is for this reason that the elements of innovation, risk-taking and proactiveness (information acquisition and information utilisation) have been included in the conceptual model.

2.5.3 How to research EO in small organisations

Wiklund and Shepherd (2011), when looking at opportunities for future research into EO, suggested the need to consider the effect of EO on an individual's intention to experiment with new technologies and new markets, as the majority of past studies have focused on the organisational level. Rauch et al (2009), in their assessment of prior research on EO, stated that the EO of an organisation is typically investigated through the top management, and that the smaller the organisation the higher the level of influence they are likely to exert. A similar position has been taken in this study, as the culture and decision-making lens adopted has been through the influence of top management. Rauch et al (2009) emphasise that such a senior view is needed as there are fewer levels of middle management in smaller organisations. The effect of EO is more pronounced on smaller organisations due to their flexibility; this allows them to quickly change and take advantage of new opportunities that appear in the market (Rauch et al., 2009). This suggests that small businesses' agility, flexibility and ability to adapt to changing circumstances may position them more favourably than their large competitors to take advantage of market opportunities presented by big data analytics. It also supports the earlier contention that the EO of the founder / MD / top management of a small business can be used to assess the EO for the organisation overall and this should be done at an individual level.

2.6 Big data

Having considered the literature on culture, decision-making in a small business context and entrepreneurial orientation, the final component of the conceptual model is that of big data. Big data is somewhat unusual in that it was broadly accepted in the commercial and public space before the academic discourse has had time to catch up (Gandomi & Haider, 2015). This may explain why most of the literature on big data has been either:

- case-based, for example Kumar and Purkayastha (2013);
- anecdotal in the evidence that it provides for linking big data usage to an increase in the performance of the large firms that adopt it, for example, Davenport (2013, 2014) and McAfee and Brynjolfsson (2012); or
- focused on the emerging areas of research and the more technical challenges that are being solved by researchers in the big data field, for example, Chen, Chiang and Storey (2012) and Gandomi and Haider (2015).

In order to contextualise the subjects of big data and big data analytics, it is necessary to look at what they are and under which literature streams they fall.

2.6.1 Business Intelligence and Analytics (BI&A)

According to Chen et al. (2012) the term “business intelligence” became popular in the 1990s, with the term “business analytics” added in the late 2000s to show the importance of analytical capabilities. The authors combined the terms to refer to business intelligence and analytics as “BI&A”. Big data and big data analytics form part of BI&A (Chen et al., 2012).

BI&A traditionally covers the technologies and applications that companies use to collect mostly structured data from their internal legacy systems which can be stored in commercially available relational databases. This data is then analysed and mined using statistical methods and well established techniques classed as data mining and data warehousing (Chen et al., 2012). What is important to note is that this data is mostly static and the models look at data that was generated months or years ago. This type of analytics allows business to perform two main types of analytics: descriptive, which focuses on reporting on what happened in the past; and predictive, which uses past data to try and predict future events (Delen & Demirkan, 2013).

Big data adds the ability to perform a third type, called prescriptive analytics (Delen & Demirkan, 2013), which combines data from the first two types of analytics and then uses

real-time external data to recommend an action that must be taken in a certain time frame to achieve a desired outcome.

2.6.2 The three Vs and the effects of constrained resources on big data

With the advent of the internet, social media and instrument data, such as location data from mobile phones, data has grown exponentially in “volume”, “velocity” and “variety” (Jagadish et al., 2014; McAfee & Brynjolfsson, 2012). These three Vs distinguish big data analytics from traditional BI&A techniques and have therefore been included in the conceptual model.

Volume is what most people think of when they first hear about big data. The literature provides many anecdotal examples of the amount of data that companies, such as Walmart with 2.5 petabytes per hour of customer transactions (McAfee & Brynjolfsson, 2012) and Google with 25 petabytes of data per day (Davenport et al., 2012), have to contend with. Storing and processing all this data comes at a cost and may historically have been a limiting factor for businesses looking to use big data as it would require an investment in both the technological resources, such as the computing hardware and software, and the personnel with the necessary skills and expertise to install and maintain that hardware. It is counter-argued, however, that the advent of cloud services – like Amazon’s EC2, Google’s Cloud Platform and Microsoft’s Azure – means that this should have become less of an issue. Small business should be able to rent processing time and storage space on a cloud solution, removing the requirement for them to invest in the physical hardware themselves, and thereby lowering the barriers to entry to adopting big data.

In some cases, velocity may be more important than volume. Velocity refers to both the rate at which the data is generated and the speed at which the data must be acted upon (Gandomi & Haider, 2015). Real time or near real-time information means that companies using big data can be more agile than their competitors (McAfee & Brynjolfsson, 2012). Agility has traditionally been seen as one of SMMEs competitive advantages and this could be eroded by the use of big data and big data analytics by their large competitors, or potentially enhanced if they are able to engage with it themselves. It is therefore arguable that adopting big data could be an imperative for small businesses that are operating in highly competitive markets. Nevertheless, as argued earlier, the very agility of small business could enable them to extract value from data at a faster rate than large business, giving them a competitive advantage. As with

volume, the advent of cloud services and their ability to scale out as processing demands increase means that the barriers to entry for SMMEs are lowering here too.

Variety refers to the forms that big data can take (McAfee & Brynjolfsson, 2012) and this can range from structured to semi-structured and unstructured data. As already mentioned, traditional BI&A is very good at storing and processing structured data, but this makes up a small percentage of big data (Gandomi & Haider, 2015). Semi- and unstructured data require new analytical methods and techniques to try and make sense of the unstructured data, and traditional BI&A is ill-equipped to handle this type of data (Gandomi & Haider, 2015; McAfee & Brynjolfsson, 2012). A highly specialised set of skills is required to analyse unstructured big data sources and make sense of the commercial opportunities that a source of data could provide. Recently the term “data scientist” was coined to identify the individuals who have the unique combination of skills and personalities necessary to handle big data analysis (Davenport & Patil, 2012). People with these skills are described as being very rare and, as such, are more likely to be offered higher salaries in order to secure their scarce skills. These salaries would most likely put them beyond the reach of what most small businesses are likely to be able to afford, due to limited resources. This presents a large challenge for small businesses. It is therefore submitted that, of the three so-called Vs, the variety of the sources of information and access to the people with the skills necessary to commercialise those sources of information will present the biggest challenge to small businesses looking to adopt big data.

It must be noted that while certain types of big data analysis will still require the sourcing of skilled resources, a number of internet-based analytical tools have become available as the technology has developed. Some of these tools, for example Google Analytics, are offered free. This suggests that small businesses that operate on a web-based business model and who are able to access large stores of data relatively easily will have an advantage over those that do not when it comes to adopting big data analytics.

Having established what big data is and some of the potential challenges that small business would have to overcome in order to adopt big data and big data analytics, we now turn to potential uses – or use cases – for big data within an organisation.

2.6.3 Uses for big data

From the anecdotal evidence provided by Lau et al. (2012), Davenport (2013) and McAfee and Brynjolfsson (2012), in the examples of how large organisations have used big data analytics to increase their firm's performance, the following uses for big data have been extracted:

- Processing very large amounts of data generated through internal operational systems and processes. Examples of this are purchase transactions and stock management by Walmart and tracking data from the delivery vehicles used by companies like UPS. This has been identified in the conceptual model as "internal".
- Sourcing external sources of data and using that information to enrich the data that is generated internally. An example of this is the combining of weather data with flight information to predict the likelihood of a flight being delayed. This has been identified in the conceptual model as "enrich with external".
- Scanning the external environment and industry for information on what is being said by your competitors and customers, using technologies such as sentiment analysis. This has been identified in the conceptual model as "scan environment".

It is proposed that small businesses, due to their limited resources, are unlikely to generate internal transaction data on the same scale as a large organisation like Walmart and, as such, are unlikely to have large stores of internally generated data. This means that the most likely cases of small organisations that are using big data analytics are in the other two presented above, namely that of enriching their internal data with external data, or scanning their external environment. In addition, with the increase in the prominence of social media and the fact that engaging with social media can help generate exposure and traffic for a small business at a much lower cost than traditional marketing approaches (Schaupp & Bélanger, 2014), it is probable that small business is engaging with the free big data tools that are provided by companies like Google. These online tools provide alerts when a company's brand name is mentioned online and can provide data on the effectiveness of their online marketing strategies and campaigns. This data will allow them to measure and compare their marketing and financial metrics, as suggested in the model proposed by Mintz and Currim (2013).

2.7 Conclusion

In conclusion, the lack of research into small businesses and their use of big data, as evidenced in Chapter 1, along with the topical nature of big data and business intelligence in general in the literature (Bayrak, 2015; Chen et al., 2012), suggests that there is both an academic and business need for research into understanding how small business is going about adopting big data and big data analytics.

A conceptual model based on the literature streams of culture, decision-making in small business, entrepreneurial orientation and big data was constructed and defended and was presented in Figure 2.1. The model contended that that the founder / MD / top management team was proposed as having an influence on both the decision-making preference and the entrepreneurial orientation of the organisation, through their ability to influence the organisation's culture, and thereby the individuals within the organisation. From the literature it was derived that decision-making methods can broadly be split between rational and intuitive decision-making, with the rational approach being relevant to big data adoption, as it relies on the use of evidence. It was argued from the available literature that a high level of entrepreneurial orientation, specifically with respect to proactiveness (and a focus on information acquisition and information utilisation) and innovativeness and risk-taking, was necessary for a small business to be actively engaged in looking for information on their environment to use in identifying and exploiting opportunities, as well as being willing to invest in new technology. Resource theory suggested that all of this has to occur within the context of the resources available to the small business, which is generally acknowledged as being resource constrained. The more technical aspects of big data, the so-called three Vs of volume, velocity and variety detailed in the literature, each presents a different set of challenges for small business and they needed to be considered in the context of the potential use cases that were identified from the literature on how large organisations are employing big data analytics.

Research propositions based on the questions posed in Chapter 1 and the conceptual model and arguments presented in Chapter 2 have been detailed in the following chapter.

Chapter 3: Research Propositions

3.1 Introduction

The review of the available theory during the literature review process has led the researcher to make the following research propositions.

3.2 Research Proposition 1

There are two main factors that drive the successful use of big data in small businesses:

Research Proposition 1.1

The decision-making culture of the business must support the use of evidence in decision-making, otherwise there will be no support for the use of big data analytics in the business.

Research Proposition 1.2

A small business must have a leader (founder / owner / MD) or management team who displays high levels of entrepreneurial orientation, specifically with regard to the elements of:

1. innovativeness
2. risk-taking
3. proactiveness.

Innovativeness and risk-taking are required if a business with constrained resources were willing to invest in new technologies or skills. Proactiveness is required if a business were to actively seek to understand its environment and look for opportunities to exploit.

3.3 Research Proposition 2

Small businesses that are successfully using big data use it for one or more of the following purposes:

1. To process large internal data stores to improve operations;
2. To enrich internal data with data sourced outside the organisation; and
3. To scan their environment and their industry.

However, small businesses are unlikely to have large internal data sources and should focus on either enriching internal data or using big data to better understand their environment and help them segment their market.

3.4 Research Proposition 3

Resource constraints have been seen as a limiting factor preventing small businesses from adopting big data. However, technological advances and internet-based tools mean that the barriers to entry to using big data are lowering all the time. Therefore, of the so-called three Vs of big data, variety should present more of an obstacle to small businesses than either volume or velocity, in their context of operating under resource constraints.

Chapter 4: Research Methodology

4.1 Research design

4.1.1 Method: qualitative, exploratory

The research methods reviewed in the literature suggested that exploratory studies should be used where:

- A research problem requires exploration, where a researcher aims to discover new information about a topic or when researching a new phenomenon (Saunders & Lewis, 2012, p. 110);
- Little has been written about the population or topic being studied and the researcher looks to listen to participants and build an understanding based on what is heard (Creswell, 2014, p. 29).

As established in Chapter 2, big data is demonstrably a nascent concept and most of the research done to date has focused on case studies with large organisations. This leaves the SMME space relatively unknown as no research on big data and SMMEs could be found at the time of the literature review. Therefore, this area of research is best approached using an exploratory research method, which will also generate the primary data for the purposes of the research, as no secondary data are available.

Exploratory research is well suited to a qualitative method such as interviewing (Saunders & Lewis, 2012), which would give the respondents an opportunity to give a perception of their reality and allow for a richness in the data analysis through the use of thick descriptions (Creswell & Miller, 2000). This would also add an element of credibility in the research study (Creswell & Miller, 2000). This is echoed by Creswell (2014), who states that one of the main reasons to choose a qualitative approach is if the study is exploratory, which usually means that very little has been written on a topic or the population being studied and that the researcher must then listen to the respondents and create an understanding based on what is heard during the interviews.

The research method used by researchers in the field of entrepreneurship has been under some debate in the literature. Three meta-analytic reviews published in the last two years have highlighted the importance of providing sufficient evidence while conducting quantitative research into the various constructs of entrepreneurship, such

as entrepreneurial intent and entrepreneurial opportunity. Schwab (2015) argued that as all studies are subject to limitations and can only report their results in terms of probabilities, empirical entrepreneurship studies should report their effect sizes and confidence intervals. This is so that it is possible to use meta-analytic methodologies to look across studies and assess if there are common findings in different contexts by compensating for those limitations. Schlaegel and Koenig (2014) echo this sentiment and in their meta-analytic review of studies on entrepreneurial intention they encourage authors and publishers to set standards that facilitate evidence-based research in the entrepreneurship field, as only three quarters of the studies analysed reported reliability information. In contrast, Suddaby, Brutton and Si (2015), who conducted a meta-analysis of nine qualitative studies on entrepreneurial opportunity, suggested that there is currently too much focus on a mono-method approach – that of using a quantitative method with an over reliance on surveys. They argued that a qualitative approach is needed to reveal new insights. This further supported the use of the qualitative approach in this research.

4.1.2 Data collection and measurement instrument: Semi-structured, long interview

Once the need for an exploratory, qualitative research method had been established, the appropriate means of data collection for this research was identified as individual, semi-structured, in-depth interviews, using the long interview method, as the researcher is looking to understand a relatively new area of research (McCracken, 1988; Saunders & Lewis, 2012). Semi-structured interviews are useful where the researcher is unsure of the answers that a respondent will give, the questions are complicated and the order in which the questions are given can be varied depending on how the respondents answer the interviewer (Saunders & Lewis, 2012). It is also possible to decide to not ask a certain question or topic if they are found to be irrelevant to the respondent (Saunders & Lewis, 2012). This allows the interviewer to more fully explore a topic or theme that the respondent raises that they may not have been identified during the literature review, or to omit some aspect that is not relevant to the respondent's particular context. The researcher felt that individual interviews were most appropriate, as this would give the respondent an opportunity to speak more freely and without having to worry about what other members of their organisation would think about what they were saying and giving as a true a picture of their reality.

The long interview provides the researcher with an opportunity to understand how a respondent thinks and to see the world from their perspective (McCracken, 1988). This perspective may provide some insights that may either affirm or contradict the propositions that the researcher has drawn from the available literature, as well as add an element of depth to the research. Following McCracken's (1988) long interview method, a discussion guide was prepared to assist the researcher during the interview. The discussion guide provides the interviewer with a number of prompts that can be used, starting with a set of biographical questions. A set of opening, grand-tour general questions are then asked and once the respondent is forthcoming with information, floating prompts are used to sustain the conversation. Where categories that have been identified in the literature review do not come up in the conversation, the interviewer can take a more proactive role and use planned prompts to focus the conversation in the direction necessary.

Saunders and Lewis (2012) suggest that it is good practice to review the discussion guide after each interview and, if necessary, adapt the questions based on the outcomes of the previous interviews. This would allow for the researcher to include additional questions regarding themes identified inductively during the previous interviews and to test if this is common among the other members of the study. Doing this also forces the researcher to review the results of the interviews as they are completed, and to identify whether they have reached a point of data saturation or not (Saunders & Lewis, 2012). During this study, the interview guide was updated following the first interview to include a preamble that the interviewer could use to establish a rapport with the respondents. Questions were added to test for a theme of people fitting-in the organisation and an induction process or training that was inductively identified during the first interview. Following the second and third interview, the guide was again reviewed and updated, producing a version that the researcher, upon reflecting on the experienced gained during the first three interviews, was comfortable would not need any further changes. These guides have been included in the Appendices.

All interviews were recorded using a digital voice recorder and all recordings have been kept and submitted as part of the evidence of this study. No notes relevant to the data collection were taken but the researcher elected to make notes of points that would require some clarification at a later stage in the interview, rather than to interrupt the respondent's flow of conversation.

4.2 Universe / Population

The potential universe for this research consisted of all businesses that are using big data, have managers and that make decisions.

The definition of what constitutes an SMME varies in the literature and according to different development and finance agencies. The United Nations Industrial Organisation (UNIDO) broadly classifies SMMEs in bands based on their level of employment, with an upper ceiling of 249 (Luetkenhorst, 2005).

Dababneh and Tukan (2007) identified four different agencies and their classification of SMMEs, including the European Commission, the Multilateral Investment Guarantee Agency / International Finance Corporation, the Asia Pacific Economic Cooperation and UNIDO. The general consensus was that organisations need to be considered by staff headcount, annual turnover and/or asset values (Dababneh & Tukan, 2007).

In South Africa, the National Small Business Act No 102 of 1996 (1996), which was amended by the National Small Business Amendment Act of 2003 (2003), uses the metrics reflected in Table 4.1, partitioned by industry:

Table 4.1 – Definitions of SMMEs in the National Small Business Act of 1996 (1996), amended by the National Small Business Amendment Act 2003 (2003)

Enterprise Size	Number of Employees	Annual Turnover (SA Rand)	Gross Assets, excluding fixed property
Medium	100 to 200, depending on industry (1996, 2003).	R4m to R50m (1996); R5m to R64m (2003), depending on industry.	R5m to R10m, depending on industry.
Small	Fewer than 50 (1996, 2003).	Less than R2m to R5m (1996), depending on industry.	Less than R3m to R4.5m, depending on industry.
Very Small	Fewer than 10 to 20, depending on industry (1996, 2003).	Less than R200 000 to R500 000 (1996), depending on industry.	Less than R150 000 to R500 000 (1996), depending on industry.
Micro	Fewer than 5 (1996, 2003).	Less than R150 000.	Less than R100 000.

Using annual turnover and gross assets to define what constitutes an SMME presents a problem because, depending on how developed the economy of the country that an SMME is located in and depending on the strength of their currency, it becomes difficult to segment the business using these two metrics. What may be considered a large enterprise in South Africa or Vietnam may be a small enterprise in America or Japan. The rand value of what is defined to be a medium enterprise in South African law in terms of turnover was increased from R50m to R64m between 1996 and 2003 (1996, 2003), as shown in the table above. Considering the effect of inflation, this value should be increased further to the equivalent value in 2015 but this has not been done, as the Act was last amended by the National Small Business Amendment Act of 2004 (2004). What remained constant between the Act of 1996 (1996) and the Amendment of 2003 (2003) was the metric of the Number of Employees within the definition of each Enterprise Size, as shown in the table above. This suggests that annual turnover and asset value are not useful in segmenting small businesses, but rather that the segmentation should rely on the number of employees.

The National Small Business Act of 1996 (1996) also has separate bands with different upper bounds on the number of employees per industry. However, the researcher felt that to concentrate on one industry would make the available population too small as big data has a wide variety of applications across a number of industries. This is supported by the bibliometric survey performed by Chen et al. (2012) who identified applications for big data across e-commerce and market intelligence; e-government and politics 2.0, science and technology; smart health and wellbeing and security and public safety. The population for this research was therefore limited to SMMEs that have 200 or less employees, but was not limited by industry, annual turnover or gross assets.

4.3 Sampling

4.3.1 Sampling method

A non-probabilistic sampling technique was used to identify potential candidates to interview and no sampling frame was used because a full list of the population of SMMEs that use big data was not available. The researcher looked for SMMEs that have used big data analytics by using a combination of snowball and convenience sampling (Saunders & Lewis, 2012). People known to the researcher were asked to provide references to small businesses that were using big data and interviews were requested with the most senior member of the organisation who was willing to be interviewed. In line with Research Proposition 2, respondents were asked during the interviews if they

were using big data analytic techniques internally, externally (on behalf of others) or if they were making use of the big data analytics tools that are available on the internet, such as Google Analytics, to confirm they were eligible.

4.3.2 Sample unit

The sample unit under study in this research is the individual respondent and their perception of the decision-making culture at the SMME and their own entrepreneurial orientation.

4.3.3 Sample size

With regard to sample size, McCracken (1988) states that with qualitative research it is not an issue of generalisability but of access, and that it is more important to work longer, with fewer people, than superficially with many people. McCracken's (1988) view is that eight interviews should be sufficient. Saunders and Lewis (2012) maintain that most texts recommend establishing the number of interviews inductively, or until data saturation has been reached.

Therefore a sample size of eight would have been sufficient for the purposes of this study or until data saturation was reached (McCracken, 1988; Saunders & Lewis, 2012). Based on the time and resources available, the researcher was able to interview nine respondents over a period of a month. By the end of the ninth interview, nothing substantially new was heard and, given the amount of data captured by that point and the range of respondents interviewed, the researcher did not seek any further interviews.

The bulk of the interviews were done with respondents who had identified themselves as either the Managing Director or CEO, a CTO (member of EXCO), a Sales and Marketing Director (member of EXCO) or Team Leaders who had identified themselves as part of their organisation's management team. Table 4.2 shows the date of the interviews, the initials of the respondent and their position in their organisation.

Table 4.2 – Interview summary – ordered by date

Order	Date	Respondent	Position
1	13 July 2015	GB	Managing Director
2	27 July 2015	JA	Managing Director
3	28 July 2015	SC	Managing Director
4	4 August 2015	AT	Head of Analytics
5	5 August 2015	BL	Chief Technology Officer
6	5 August 2015	DT	Managing Director
7	6 August 2015	RJ	Sales and Marketing Director
8	6 August 2015	RV	Managing Director
9	13 Aug 2015	FM	Team Leader

4.4 Data analysis

4.4.1 Analysis tool

All the interview transcripts were analysed using ATLAS.ti, a computer-aided qualitative data analysis software (CAQDAS) program.

4.4.2 Transcript preparation

The first interview was fully transcribed by the researcher before the second interview commenced. The other eight were submitted to a transcription service. The interviews were completed and the transcripts validated against the audio recordings to ensure their accuracy. All transcripts were formatted in the same manner to facilitate the use of the analysis tools provided by ATLAS.ti, such as auto-coding, code occurrence, code co-occurrence and the codes-primary documents table, following the practices recommended by Friese (2014).

The respondents have been anonymised by the use of their initials whenever they are referred to and the transcripts have been sanitised of any reference to the names of the respondents, the company or the group of companies they work for, as well as any client names that might reveal who they are. No information was recorded regarding the respondents' age, gender, education levels or race group as this was not relevant to the study. A detailed account of the transcription process followed has been provided in Chapter 5.

4.4.3 Method of analysis

The researcher elected to use thematic analysis (Braun & Clarke, 2006) for the purposes of analysing the transcripts and then describing the results. The authors recommend that it is the first qualitative analysis method that researchers should learn, given its flexibility, and that identifying concepts into themes is one of the few skills shared with other forms of qualitative analysis.

Saunders and Lewis (2012) list three steps that can be used to look for patterns and themes in the data by 1) developing meaningful codes to describe the data; 2) deciding on the appropriate unit of data that categories can attach to; and then 3) attaching those categories, which suggests a deductive approach to coding. However, the goal of qualitative research is to identify and then refine categories during the processes of the research and researcher must expect these categories to change in the course of the research (McCracken, 1988).

Creswell (2014) recommends that an initial coding table should be developed based on the review of the theory and then allow the codes to develop and change as additional information is discovered during the analysis process, which suggests a mix of both a deductive and inductive approach to coding the data. Given the exploratory nature of the research and the possibility that new and interesting themes would be found during the transcript analysis, the researcher decided to adopt the mixed approach and develop an initial coding table for the purposes of deductive coding, which was used during the first two coding passes. It was planned that any codes that were created inductively would be identified separately from the deductive codes. The details of the convention adopted by the researcher during the actual analysis have been detailed in Chapter 5.

4.5 Research limitations

4.5.1 Researcher bias

Exploratory research is subjective and is influenced by the perspectives of the researcher. It is therefore important for the researcher to acknowledge those potential biases, as their context will have an influence on how they interpret the findings of the research (Creswell, 2014, p. 188; Saunders & Lewis, 2012), and their culture may create as much “blindness as insight” (McCracken, 1988, p. 6). Therefore, it must be stated that the researcher has extensive experience working in IT in the insurance industry, both in the application development and business intelligence space and all while working for

SMMEs. As a result, some of the interviews covered issues that are of a more technical nature, such as the software development life cycle the respondent was using, or some of the challenges they were solving that are particular to the insurance sector. This may have biased some of the answers given by the respondent or may have placed too much emphasis on a particular theme.

4.5.2 Sampling bias

The use of snowball sampling resulted in a number of businesses that are involved in the insurance industry in some form – three of the nine respondents were in the insurance industry specifically and one other had developed applications for clients in the insurance industry. This may limit the transferability of this research to industries that are not as heavily regulated as the insurance and financial services sector in South Africa. High levels of regulation, for example the FAIS legislation, means that companies operating in the insurance industry need to be aware of changes in their legislative environment and the impact that that regulation has on their business. They are therefore more likely to engage in regular environment scanning, which is one of the themes identified during the literature review. This regulation also means that insurance companies are more likely to have good data management practices in place in their organisation and that organisations handling insurers' data will have to comply with those practices.

4.5.3 Respondent's bias

All the respondents showed a high level of comfort with using various technologies and tools in their business models. Five of the nine respondents maintained internal IT development staff (GB, JA, AT, BL, RJ); one used a combination of internal developers and external contractors (RV), one had a long-term relationship with an external development partner (FM) and the two respondents involved in digital marketing / social listening made extensive use of analytics tools and technologies. While this may point to the fact that an understanding of technology is an important aspect of an SMMEs success in adopting big data, no companies that do not have the same access were interviewed and thus no data are available to provide a valid counterpoint. This affects the transferability of the findings of this research. However, given the newness of the field and the limited number of SMMEs that are using big data, it may provide initial insight that could be built upon.

It has been argued that research involving entrepreneurial orientation may be affected by a survival bias (Wiklund & Shepherd, 2011) because while concepts such as risk-

taking favour growth, they may also be related to firm failure (Rauch et al., 2009). Four of the nine respondents belonged to organisations that are older than 14 years, and due to their higher level of maturity and sophistication, they have been grouped together and identified as mature.

Eight of the nine respondents were members of the EXCO of the organisation and while this provides a good overall view of the organisation, there is only one counterpoint from within the middle management levels. This may have introduced an “elite bias”, which does not provide a sense from the broader organisation (Meyers, 2013).

4.6 Research validity

Validity is defined by Saunders and Lewis (2012) as ensuring that the research findings are really about what they appear to be about. Creswell and Miller (2000) provide details of nine “lenses” that can be used to establish the validity of a study and the researcher has chosen four of these and will apply them where they are relevant. These lenses are “researcher reflexivity”, “disconfirming evidence”, “thick, rich description” and to a lesser extent the “audit trail” (Creswell & Miller, 2000, p. 126).

Researcher reflexivity is concerned with the lens the researcher brings to the collection and interpretation of the data gathered during the research process and it is important that the researcher self-disclose any biases or perspectives before the reader reaches the findings of the research (Creswell & Miller, 2000). This has been done under Researcher bias in section 4.5.1.

Disconfirming evidence involves a process whereby the researcher first identifies the preliminary themes and then searches for data that are consistent with and disconfirm these themes (Creswell & Miller, 2000). This was done in two ways:

1. The initial coding scheme was developed after the first interview had been transcribed by the researcher. It was subsequently expanded and then refined over a number of additional coding passes. Codes identified after the initial coding scheme development and during the transcription analysis have been separately identified with a suffix of “*” on the code.
2. A final coding pass was done where any quotes that disconfirm a theme or topic were identified for inclusion in Chapter 5 and these have been included under the relevant sections, along with the evidence from the transcripts.

Thick, rich descriptions require the researcher to describe additional information regarding the setting, the participants and the themes of the study in rich detail (Creswell & Miller, 2000). The first part of Chapter 5 begins with details of how the respondents were interviewed, where the interviews were done, what level of participation was offered by the respondents and a description of the willingness of the interviewee to participate in the research. In addition, contextual information is provided regarding the size of the respondent's organisation, their industry or segment focus, information pertinent to the topic under review and any other information that could provide a sense of the "voice" with which the respondent was speaking. The quotes provided have also been left as close to the original as document space would allow and any contraction has been shown using ellipses (...).

The "audit trail" lens establishes validity by providing clear documentation of all research decisions and activities, either throughout the account or in the appendices (Creswell & Miller, 2000, p. 128). This approach has been applied by providing a very clear account of the document management and analysis process that was followed during the research in Chapter 5 as well as the versions of the interview guide that were used during the interviews. All the original recordings and the copies of the transcripts that were received from the transcription service have been retained and the hermetic units from ATLAS.ti that contain any notes, comments and research memos that were recorded during the analysis process have been included in the evidentiary documentation that was submitted along with this document.

4.7 Ethical considerations

Ethical considerations relate to the participants and the manner in which their interests were protected. All participants were English speaking and did not require a translator to be used during the interview process.

A consent form was given to each participant at the start of the interview for the respondents who were interviewed in person, or sent ahead of the interview in the case of the telephonic/Skype interviews. This allowed the respondent time to review the document before the interview began. Each consent form has been scanned and included as part of the evidentiary documentation for this research project. Please see Appendix 7 for the template of the consent form that was used.

No information regarding the age, race or gender of the respondents was recorded as these were not mentioned as a requirement by the literature reviewed during this research. All interview transcripts have also been anonymised to maintain the respondents' confidentiality. In the account, respondents are referred to by their initials only, along with any contextual information that may be relevant to the reader of the quotation or description.

Chapter 5: Results

5.1 Introduction

The interviews performed as part of this research project have provided some valuable insight into how SMMEs that are using big data analytics are using data to improve their decision-making, what they are using the big data for and how they are dealing with their resource constraints.

This chapter starts with a summary of the interviews that were done, with details of the participants and a discussion of the processes followed by the researcher to ensure the accuracy and validity of the data collection and transcription. This is then followed by a discussion of the interviews in the context of the research propositions listed in Chapter 3, which were developed deductively based on the literature review. Some additional elements were identified inductively during the coding and analysis phase and these will be highlighted where they apply.

5.2 Summary of interviews conducted and the interview method

The researcher planned to conduct a minimum of eight interviews, until a point where data saturation was reached (McCracken, 1988; Saunders & Lewis, 2012). A total of nine interviews were conducted with individuals who worked, or had worked, at SMMEs that are using big data analytics. By the end of the ninth interview, nothing substantially new was heard and, given the amount of data captured by that point and the range of respondents interviewed, the researcher did not seek any further interviews.

Table 5.1 provides information regarding the respondents who were interviewed, sorted according to their role in the organisation. All respondents' organisations fell within the 200 employee limit, as specified by definition set by the researcher in section 4.3.3. The bulk of the interviews were done with five respondents who identified themselves as the Managing Director (or CEO, labelled as MD for the sake of consistency), one as the CTO (member of EXCO), one as the Sales and Marketing Director (member of EXCO) and two team leaders who identified themselves as part of their organisation's management team. A total of 461 minutes (over 7.5 hours) of audio recordings were taken and the resulting transcripts totalled to 65 816 words. The average interview was 51 minutes long and the average transcript length was just over 7 300 words, with the two longest interviews lasting over an hour. This length of time allowed the respondents to go into

real depth about their perspective on the topics that were being discussed.

Table 5.1 – Respondents and interview statistics – ordered by role

Respondent	Position	Industry	Length (min)	Word Count
GB	Managing Director	Insurance data interchange; Risk management application.	53.32	7643
JA	Managing Director	Online e-commerce – real estate.	32.25	5687
FM	Managing Director	Online e-commerce: motor vehicles.	61.02	9176
BL	Managing Director	Insurance and GIS data as a service.	54.23	7805
RV	Managing Director	Online feedback; Analytics as a service.	53.42	7074
RJ	Chief Technology Officer	Traditional and big data analytics consulting, specialist skills recruitment.	61.01	8830
AT	Sales and Marketing Director	Insurance data interchange; Claims goods procurement.	48.09	6935
SC	Team Lead – Client Services	Digital marketing; Online listening.	50.32	6278
DT	Head of Data Analytics	Digital marketing; online listening.	47.04	6388
Average			51.19	7313
Total			460.70	65816

The interviews were conducted over a period of a month using the discussion guide that was developed in advance and the long interview method was followed (McCracken, 1988). Most of the interviews were conducted in person and in a private meeting room, except for two; one of which was conducted telephonically and the other over Skype. All interviews were recorded using a digital voice recorder and the recordings were downloaded from the device and backed up to the cloud before leaving the interview location. No notes were taken during the interview for data collection purposes but the interviewer wrote down questions that were to be asked later during the interview to clarify some points and the discussion guide was marked off as the discussion progressed.

The first interview was done with someone well known to the researcher as a pilot test for the discussion guide and the researcher's approach to interviewing, as recommended by Saunders and Lewis (2012). The audio recording of the first interview was then transcribed by the researcher, an exercise recommended by Meyers (2013), and listened to again to verify its accuracy. A number of texts on qualitative research have guides on how to best ask questions during an interview (McCracken, 1988; Meyers, 2013;

Saunders & Lewis, 2012). It was only by first putting the theory into practice and then reflecting on the experience that the researcher was able to assess how closely they had applied that best practice. Through transcribing the first interview, the researcher had an opportunity to listen to how the interview had been conducted, how the questions had been asked and which of the original questions in the interview guide flowed in the conversation and which did not. The initial interview guide was then reviewed in accordance with best practice and the order of some of the questions was changed to improve the conversation flow. A preamble was added to guide the researcher during the introduction at the beginning of the interview, while trying to establish a rapport with the respondent, as suggested by Meyers (2013). Once the researcher was more comfortable with the process, the other interviews were then scheduled as the respondents had time available.

The second and third interviews followed close together and, again following the practice recommended by Saunders and Lewis (2012), the interview guide was reviewed and amended based on the results of the two previous interviews. By the end of the third interview, the researcher had developed a level of comfort that the discussion guide was working, even if it was not followed in the exact same sequence each time, and the same version was therefore used for the rest of the interviews. Due to scheduling constraints, interviews four to eight were arranged over a three-day period and the final interview was conducted the following week with an individual with whom it was very difficult to schedule an appointment. Please see Appendix 2 for the first version of the discussion guide; Appendix 3 for the interview guide that was used for interviews two and three; and Appendix 4 for the interview guide used for interviews five to nine.

Out of the nine respondents, only two were known to the researcher prior to the interviews. Most of the respondents were alone when interviewed and were forthcoming with their perspectives and information relating to their positions. They were willing to give the researcher ample time to review the questions in the interview guide, which has created a rich source of data to analyse. Respondent six (DT) was interviewed telephonically. Since DT works in an open plan office, complete answers were not always provided and the researcher needed to prompt them on certain questions. The sense of the researcher at the time was that this was more due to the distraction from the room and the method of communication (telephonic) than from a reluctance to voice their opinion. Respondent nine (FM), after reading the consent document and realising that

the information gathered during the interview was to be published as part of a research thesis, became reserved when discussing the future use of technology as they were concerned about revealing any intellectual property through this process. Fortunately, this did not affect their relating their decision-making process or their views on their organisation, but only their future plans for their platform and the implications of those plans.

5.3 Interview transcription and verification

The first interview was transcribed and verified by the researcher as described in section 5.2. To save time, the remaining eight interviews were sent to a transcription service. As each transcript was received from the transcription service, the accuracy of the transcript was verified by the researcher against the original interview recording and any spelling mistakes or transcriptions and terms that were inaccurately transcribed were corrected. Any parts of the conversation that were marked as inaudible by the transcriber were interpreted by the researcher based on the context of the conversation, memory of the interview and listening to the phrases used several times in some cases. Where something remains indecipherable, it has been identified as (inaudible). Common parts of speech and interjections such as “ummm”, “you know” and “I mean” were removed and all transcripts were reformatted for consistency in the form of font size and type and line spacing. The first transcript was also reformatted according to the style of using bold for the interviewer and normal for the respondent. This took approximately two to three hours per transcript.

5.4 Transcript coding and analysis in ATLAS.ti

As per the planned data analysis method described in section 4.4, the transcribed interviews were analysed using ATLAS.ti, a computer-aided qualitative data analysis program.

5.4.1 Transcript preparation and management

Following the recommendations of Friese (2014), all the verified transcripts were converted to an RTF file format and then every paragraph in each transcript was identified with either INT: for the researcher or the initials of the respondent, for example GB: or JA:. At each change in speaker, a hard return was inserted into the transcript to allow ATLAS.ti to auto-code each statement. This allows simple identification of any quotation that is made in ATLAS as they are all already identified by the initials of the respondent (Friese, 2014). Each transcript was then loaded into ATLAS.ti and named according to the following convention:

“Initials_Role_Maturity_Use_Date”

- Initials: unique initials of the respondent – used during the transcript analysis to identify quotes and statements;
- Role: the stated role of the individual in the organisation;
- Maturity: a grouping that was identified based on the age of the organisation;
- Use: whether the organisation uses predominantly internal or external data;
- Date: the date of the interview.

This document identification scheme was developed by the researcher before all the transcripts had been fully coded and was designed to allow for the “Codes-Primary Documents Table” analysis through code families in ATLAS.ti (Friese, 2014).

5.4.2 Transcript coding and code table development

Creswell (2014) suggests that an initial coding table should be developed based on the review of the theory and then allow the codes to develop and change as additional information is discovered during the analysis process. Friese (2014) recommends that “you do not lump all the different aspects under one code name” but that you should rather develop “layers” of codes that can be kept apart and used to identify “content” and “attributes” (p. 150). To avoid the “code swamp”, two or more codes can then be applied to the same quote in the transcripts with one or more from each layer (Friese, 2014, p. 151). The researcher adapted this approach and developed an initial coding scheme based on the literature review, the research propositions and the transcript of the first interview, using the convention described in Table 5.2. Please see Appendix 5 for the table of initial codes.

Table 5.2 – Transcript coding scheme convention

Prefix / Suffix	Description
None	Codes with no special character prefix are part of the initial coding scheme and were used to identify themes for use in discussing and analysing the research propositions.
Asterisk “*”	As a <i>prefix</i> – “super codes” developed during coding analysis. As a <i>suffix</i> – codes that were created after the initial coding table was defined. Codes with the “*” were allocated during the coding process and may be consolidated under a primary code or have their own category as the themes were identified.
[category]:	Codes prefixed by a [category]: are either used to identify sets of quotes, such as evidence of the role of the respondent in the organisation or their maturity. This forms part of the transcript naming convention mentioned in section 5.4.1.
[descriptor]::	Codes prefixed by a [descriptor]:: attempt to identify the sentiment or effect the statement made by the respondent has on the theme they are discussing. Examples are importance, or whether they feel it is a positive or negative effect.

(Respondent Initials)	All statements made by the respondents were “auto-coded” using their initials and this is used throughout when quoting the respondent in the findings of the research. Examples are (GB) and (JA).
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The transcripts were first auto-coded by ATLAS.ti to indicate the respondent and any missing paragraph prefixes or hard returns were inserted into the transcripts to ensure that each auto-code covered only one individual’s statement. The transcripts were then fully coded in the following manner:

- Two initial passes of all transcripts were done to identify and code context quotes that provide evidence of role, age, data use, number of staff and number of managers in the respondents organisation, as well as any parts of the text that are strongly related to the themes identified in the literature review and any quotes that immediately stood out.
- A further two passes were done to look for any themes that were not identified during the literature review and new codes were created where necessary. These codes have been highlighted with an asterisk “*”.
- The code table was reviewed and some codes with a low occurrence count were merged with other codes; some were grouped together under the same category. Coded quotations were then reviewed to ensure a level of coding consistency across interviews.
- A final pass was done to look for concepts that occur across all interviews and then those that occur infrequently or only once. This is to find exceptions or contradictions in the data and is an attempt to remove any confirmation bias that the researcher had developed during the coding or to identify observations or insights that a respondent may have made that would add value to the research.

Please see Appendix 6 for the final list of codes used.

5.5 Details of the respondents interviewed

The details of the respondents interviewed have been provided here to give the reader a sense of who the respondents were, what role they played in their organisations and of their context. Given that the researcher followed a semi-structured, exploratory approach using an interview guide, not all respondents were asked the exact same questions in the same order. An attempt was made, however, to establish some consistent contextual information across the respondents for analysis purposes and where exact figures were given they have been recorded, otherwise the information was inferred from the answers that the respondents gave during the interviews.

5.5.1 Summary of contextual information collected

The focus of the questions asked in the interview was on how decisions were made in the organisation, as evidenced by the respondents' description and impressions of the decision-making process, the management team and the culture of the organisation – contingent upon their level within the hierarchy. The contextual information gathered in the interviews was:

- age of the organisation
- position/role of the respondent in the organisation
- number of employees
- number of managers.

Table 5.3 provides a summary of the data collected for each of the respondents' organisations, ordered by the age of the businesses to provide a natural break in the group of respondents. Four of the respondents' organisations had a median age of fifteen years, three had a median age of five and a half years and the last two were less than two years old. The organisations ranged in size from five permanent employees (RV) to 140 (RJ) and from three to approximately twenty managers (RJ) (across four subsidiaries). Given the range in the number of employees and the varying ages of the organisations in this study, it would appear that there is no one particular age range or number of employees that would give one organisation an advantage over another.

Table 5.3 – Summary of respondents' organisations – ordered by business age

Res.	Position	Business Age	Business Age Group	Employees	Managers
GB	Managing Director	16 years	14–16 years	25 permanent 5 contract	5
JA	Managing Director	15 years	14–16 years	100	6
FM	Managing Director	15 years	14–16 years	76	15
RJ	Chief Technology Officer	14 years	14–16 years	140	EXCO 5 MANCO 5–7
SC	Team Lead	7 years	4–7 years	40	10 to 12
AT	Sales and Marketing Director	5 Years	4–7 years	9 in subsidiary	4
BL	Managing Director	4 Years	4–7 years	85 in group, 15 in subsidiary	4
RV	Managing Director	18 months	< 2 years	5 permanent, contractors as required.	3
DT	Head of Analytics	11 months*	< 2 years	<200 in org.	Not specified

* DT did not specify the age of the organisation but was very clear on the age of the team, as evidenced by this quote:

“Yes, but I have actually been with [anonymous partner] for a couple of years...at some point it became obvious that we couldn’t be handling all of this, and it was time that we focused on this a little bit more and have a dedicated team but that has only been since October last year.”

As almost the entire interview with DT focused on the team, it was decided to use the team’s age and not the organisation’s age.

5.5.2 Respondents’ level of education

One potential oversight was that contextual questions about the respondent’s level of education was not included in the interview guide, and this has been identified inductively as a potential factor during the coding process. The education level is known for seven of the nine respondents, either because they mentioned it during the interview (RV, FM), it was mentioned to the interviewer before or after the interview while discussing the research process (BL, JA, RJ) or it was available on the respondents’ LinkedIn profile (DT, SC). Table 5.4 shows a list of the respondents and what is known of their qualifications.

Table 5.4 – Respondents’ qualifications

Respondent	Qualification
BL (MD, Mature)	MBA (discussion)
JA (MD, Mature)	MBA (discussion)
SC (Team Lead, Stable)	Honours Marketing Management (source: LinkedIn profile)
AT (Sales and Marketing, Stable)	Unknown
RJ (CTO, Mature)	MBA (discussion)
GB (MD, Mature)	Unknown
DT (Team Lead, Start-up)	Master’s Degree, Marketing (source: LinkedIn profile)
RV (MD, Start-up)	Industrial Engineer (transcript)
FM (MD, Mature)	Engineer (transcript)

Education may have been a relevant factor to consider when looking to understand an individual’s description of their decision-making process as it seems that their education has an influence on their approach to making decisions. Four of five members of the MD group were either engineers or had an MBA. RV, an industrial engineer, described their use of their engineering training while managing their business.

“...so our background is industrial engineering. So the practices that we use is three (pause) well we keep a matrix of by when, whom, and what...” (RV, Managing Director, Start-up)

FM related how logic had helped him in dealing with information technology in the following quote.

“I think the key thing is (pause) funny enough **I am a qualified engineer** and I will state that engineering has helped me a hell of a lot in **contributing to the success of IT**. Why? **Because it is about a logical process and for as long as logic prevails and you keep pushing the envelope I think you will be doing okay**, because as I said, there is no guidebook to do this, not if you were at the front.” (FM, Managing Director, Mature, **emphasis added**)

BL, an MBA graduate, made reference to Porter’s (1985) strategies for technological differentiation and competitive advantage when describing how they had chosen a strategy of focus. BL further described how they used a systems thinking approach when solving problems in their organisation, using causal loop diagrams.

“...among the 3 sort of generic strategies, one being cost advantage, the other being differentiation, we chose one of **focus**...I have a system’s world view. I believe that **everything operates as a system**, and I consider [anonymous] to be a social system. I feel that **my role as the leader** of [anonymous] is to **make sure that all of the variables that are in the system are interacting well**. Essentially I feel that I am managing a whole bunch of variables and I need to act to improve those variables every day...So I kind of **view my business as a big causal loop diagram** and if any of those variables starts to exhibit undesirable behaviour I want to identify the variable that is actually driving that.” (BL, Managing Director, Stable, **emphasis added**)

The other MBA graduate (JA) related that over time they began to make more and more decisions using data, instead of people’s opinions.

“So we became more and more disciplined over time to be able to use data, to make data-informed decisions rather than just opinion based decisions.” (JA, Managing Director, Mature)

Conclusion: Education level

While the respondents’ view of the influence of their education on their approach to decision-making cannot be interrogated post the completion of all the interviews, it may be inferred that, at least for almost the entire MD group, an individual’s education may affect their approach to decision-making. Further, given the MD’s role in influencing their organisation’s culture by extension, that education may affect their organisation’s adoption of big data analytics.

5.5.3 Respondents by roles

An attempt was made to interview the most senior individual in an organisation who was willing to engage with the researcher. All respondents were asked to describe their position or role in the organisation and Table 5.5 details the responses given, with the common reference allocated to each respondent. Five of the respondents were the Managing Director, three of which fell in the “14–16” year group, one in the “4–7” year group and the other in the “<2” year group. Of the other respondents, two have been grouped together as “Team Lead” as they described their role as being the head or manager of a team inside their organisation. One team was very new, less than 11 months old and the other was in the “4–7” year group. The last two individual respondents were the CTOs of an organisation that does consulting in traditional and big data analytics (14–16 year group) and the Sales and Marketing Director of a company that switches insurance data and provides tendering and procurement in the insurance industry (4–7 year group).

Table 5.5 – Respondents by role – ordered by the number of respondents

Common Reference: Code:	Self-description of position under this common reference	Number of respondents
Managing Director Code: MD	MD CEO	5
Team Lead Code: TL	“Head of Analytics” team (DT) Manager in social listening team (SC)	2
Chief Technology Officer Code: CTO	Found in respondent’s email signature	1
Sales and Marketing Director Code: MKT	Found in respondent’s email signature	1

An overview of the respondents in each of the roles follows.

5.5.3.1 Managing Directors (GB, JA, FM, BL, RV)

Five of the nine respondents were grouped as Managing Directors (MDs). All MDs had some form of ownership in their business and four were founding members of their organisation. Of the five interviews, four lasted more than 50 minutes – the longest being 61 minutes. The shortest interview, with JA, is recorded and transcribed as 32 minutes, which is where the formal interview ended. However, the full audio recording actually extended to over 50 minutes, with the end of the discussion focused on the NGO that the respondent was involved in setting up that had the aim of training software

developers in South Africa, at no cost to the students. This interview was conducted early on during the data collection process and the researcher felt that this part of the interview fell outside the scope of this research. It is described here to give additional context to the interviewee. JA was also the only member of the MDs group who spoke about an organisation they no longer worked for as they had sold their interests in the organisation.

The number of employees in the MDs' organisations ranged from five up until 100, which makes the number of employees unsuitable for analysis of this group. The ages of the organisations ranged from less than two years old, up to over 14 years old. The MDs provided a view across business age, number of employees and industries sampled during this research, excluding digital marketing / social listening.

5.5.3.2 Chief Technology Officer (RJ)

This was the second longest interview and was characteristically technical. RJ had the most complete understanding of what big data is and how it is currently being used. RJ could provide a unique perspective of what other SMMEs are using big data for. RJ's organisation provided both traditional and big data analytics consulting services to other companies, some of which he identified as being SMMEs themselves. RJ's organisation consisted of a group of four small business, the largest of which had 90 employees, and the group was 14 years old. The group had experience across a number of industries and in both public and private sector engagements. RJ and the other EXCO members were major shareholders in the group.

5.5.3.3 Sales and Marketing Director (AT)

AT's organisation was part of a group of small companies and he was a member of the organisation's EXCO. AT was non-technical and focused on the value add of the service that their organisation provides. The organisation was less than five years old, had nine employees and was focused on the insurance industry. The respondent described themselves as one of the partners and it can therefore be inferred that they have some ownership in the business. AT also explained that the concept behind the subsidiary was their idea and that the business was created to focus on a market segment where they could leverage the existing capabilities of the group.

5.5.3.4 Team Leads (DT and SC)

DT and SC have similar perspectives, given that they both operate in the digital marketing / social listening "space". DT was employed by two companies that were in the process of merging. While DT was a member of the one organisation's EXCO, the

interview focused on their role as the head of a new team within the organisation, which DT created and led. SC is the only non-EXCO member, but identified themselves as part of the management team. SC’s perspective is characteristically operational as they were responsible for managing the relationship with the clients and ensuring delivery within the team.

5.5.4 Respondents by business age group and “maturity”

The respondents’ organisations have also been grouped together based on a natural break in their age to provide a basis of comparison during the analysis. To gain an understanding of their decision-making culture, respondents were asked to describe how decisions were made in their organisation and a number of floating prompts were used to ascertain: whether their organisations had regular management forums; whether the forums were formal or informal, operational or strategic; whether there were regular metrics and reports that were looked at during those meetings; and whether the senior management were more generalist or specialist. Each group was then given a description of their “maturity” based on the respondents’ high level description of the processes, management forums and resources available within their organisations. The label “start-up” has been given to the organisations and teams that were less than 18 months old, the members of which are shown in Table 5.6. In this group, processes were not well defined and they were still establishing resources in their organisation.

Table 5.6 – Start-up group members

Maturity	Respondent	Quotes describing their “maturity”
Start-up < 2 years	RV Managing Director	<p>“Yes so we do Agile – I am not sure if you are familiar with Agile Development?...So we do a (pause) twice weekly stand-up, not daily ... so we have a three week cycle that we run... but you know it doesn’t always work like that... We don’t follow Agile that strictly because the team is so small...It is just too much paperwork at the moment for us.” (emphasis added)</p> <p>“Our system is just too complex to get a guy on that isn’t worth it (pause) or that is just another developer. And because we don’t scope our processes 100% to the nth detail...” (emphasis added)</p> <p>“Myself, it is quite a bunch of different things at the moment...” (emphasis added)</p>
	DT Team Lead	<p>“...no people, no budget, and also no tools initially other than client tools...”</p> <p>“...usually I need to convince someone else to give me some budget...”</p> <p>“...so there is no formal process and it is usually a hit-the-ground running...” (emphasis added)</p>

The members of the “stable” group shown in Table 5.7, those businesses that were between four and seven years old, generally said that when the organisation has had time to establish itself then its members are able to focus on specific tasks, establish some processes and procedures, and operational metrics become more prevalent. However, the MD’s role in two of these organisations was described as being more general, as they needed to be able to perform a number of roles.

Table 5.7 – Stable group members

Maturity	Respondent	Quotes describing their “maturity”
Stable 4–7 years	BL Managing Director	<p><i>“It was initially a challenge because [anonymous] is now in its fourth year and any entrepreneur initiative that is still in its infancy (pause) you know the MD is anything from chef, cook and bottle washer. So it was initially a challenge but over time we have managed to establish resource and structure which has made that easier.” (emphasis added)</i></p> <p><i>“So our meetings fall under three categories, one is an operational meeting...other is a strategic meeting...then the third meeting we have is what we call our policy and values meeting”</i></p> <p><i>“...four generic metrics that we look at in the operations meetings, which would have their own sub-metrics...” (emphasis added)</i></p>
	AT Sales and Marketing Director	<p><i>“...from a structural perspective I think he [the Managing Director] is sort of the mother hen if I can call it that, keeping everything together...” (emphasis added)</i></p> <p><i>“Yes we do. We (pause) look there are a couple of points that we discuss in each of our meetings...We sort of have set meetings just to answer your question, around various points around the business” (emphasis added)</i></p>
	SC Team Lead	<p><i>“Yes, definitely. In the digital team there was a Monday morning EXCO meeting that takes place, then the various teams have meetings on Tuesdays.”</i></p> <p><i>“We tended to stick to a process, a rigid process, we did everything by the book” (emphasis added)</i></p>

The members of the mature group, shown in Table 5.8, demonstrated that once organisations are established, they bring in more structure and in most cases are more likely to look at metrics during their operational forums. In terms of resource specialisation, three of the four businesses had specialist managers looking after specific roles. There was also an understanding by one respondent in particular (FM) that the need to reduce the key man dependency faced by the business should he be “hit by a bus”, and to mitigate that risk he had appointed additional specialists to manage the “commercial” decisions. RJ, whose organisation was the largest in terms of number of employees, stated that the EXCO each had one portfolio, though it was fairly broad.

Table 5.8 – Mature group members

Maturity	Respondent	Quotes describing their “maturity”
Mature 14–16 years	GB Managing Director	<p>“Ya, we’ve got quite a strict process” (emphasis added)</p> <p>“Yes, we meet weekly, and each week one of the EXCO members will present their – what’s happened in their area and what they are planning to do over the next three or four months.”</p> <p>“We have metrics per business unit, so for example the head of product development has to say this is the new release were working on, this is the date we expect it, these are the feature sets that we are adding to the product.” (emphasis added)</p> <p>“...typically each EXCO member is given one focus, so the head of product development sits on EXCO, and the head of administration, who look after all the internals, sales and marketing. So each person has a role within the business.”</p>
	JA Managing Director	<p>“Yes, so we had monthly management meetings, quarterly directors” meetings, and in each team they had their own formal or informal structures to meet...”</p> <p>“Yes, so every head of each department would give feedback on the previous month”</p> <p>“...lots of metrics that we would use...”(emphasis added)</p> <p>“Yes, so we had lots of specialists, we had a CA that was head of finance, we had a head of HR, head of IT, head of sales, head of marketing. Yes, I think that was about it.”</p>
	RJ Chief Technology Officer	<p>“In terms of utilisation of data we are data rich... or we utilise data seriously. So we utilise data seriously. Where we utilise data is in terms of how we are performing operationally and where we are seeing that there is trending down or trending up in the type of services we offer.”</p> <p>“We have metrics and analysis... that is right and we do also look at it from a sales pipeline perspective.” (emphasis added)</p> <p>“Most of the managers have one portfolio underneath them but they are broad portfolios so that is professional services and sales... it is a broader thing so, yes, they get involved in multiple functions. At the EXCO level we play multiple roles. So we’ve got responsibilities, active MANCO responsibilities in each business unit.”</p> <p>“...the consulting team and we take all the way from interns all the way through to principal consultant level ...there they can be generalist running a whole range of engagements or specialist in specific niche areas. We have a bit of a spread.”</p>
	FM Managing Director	<p>“Okay so the [anonymous] business has been through quite a shift in the last 18 months. I was the be all and end all of the business but I also got to realise two things – A, I’ve got two hands; B, the business was at high risk because if I got hit by a bus the business was in trouble... So there has been a lot of change that has happened where I’ve got in supporting (pause) I have an MD now and an FD and what have you. It is all good and well and they make the decisions on the commercial stuff...” (emphasis added)</p>

Conclusion: Maturity

From the above analysis of the respondents based on their emerging “maturity”, there is evidence to support a finding that the older, more established businesses in this study (stable and mature) are more likely to have regular operational and strategic management forums and that they make use of metrics as a means of reporting back to the management teams in those forums. Even if those metrics have been sourced using traditional analytics methods from their internal systems, it may suggest that businesses that are already used to looking at metrics in formal management forums on a regular basis will be in a better position to adopt big data analytics than those that do not, as they will be predisposed to making decisions based on metrics.

5.6 Transcript analysis through word counts

An analysis was done on all the transcripts using individual word counts after the coding had been completed to get a sense of which words occurred the most during the interviews and how closely these words matched the coding table developed by the researcher. The word counts include the questions asked by the researcher and the answers given by the respondents. This provides a means of validating, or triangulating, the results of the thematic analysis of the interviews presented in section 5.7.

5.6.1 Approach

The ATLAS.ti Word Cruncher analysis tool was used to draw a list of all the words that occurred in the transcripts, along with a count per word, per primary document (transcript). The full list, comprising 3987 words, was transferred to Excel and then all words that occurred less than three times in total were filtered out, leaving 1768 words. This list was reviewed and all common words that were not descriptive or contextual were ignored, including they, them, which, this, that. This reduced the list to 837 words and these were transferred to another sheet for review and consolidation.

Words that represented the same thing but which were used in either a different tense or as a singular or plural were then grouped under a single word, for example {focus; focused; focuses; focusing} were grouped under {focus} – termed group word. During this review, some additional words were removed that upon second consideration were either too nebulous, for example {big; bigger; biggest}, or were idiosyncratic to the researcher’s method of speech when asking questions, such as “in terms of” which resulted in “terms” appearing 124 times in the overall word count. This resulted in a list

of 746 words, grouped into 521 distinct words or word groups. The word list was then transposed from a matrix layout to a set layout and loaded into a database table so that it could be queried using Excel’s PivotTable. This allowed the word list to be filtered and analysed more readily and for different groupings of respondents to be compared by the Excel “Top 10 Occurrence” pivot table function. The word counts are considered for the transcripts overall and then by major respondent groups.

All transcripts

Table 5.9 lists the most common words that occurred across all transcripts, ordered by frequency count.

Table 5.9 – Word group count top ten – all transcripts – ordered by frequency

Group Word	Count
data	499
people	322
client	306
time	197
need	143
decision	140
new	136
analytics	127
product	108
different	102

Overall, the word “**data**” was used the most during the interviews. This is congruent with the research focus on the use of data in the organisation and “big data” as a concept. Please note that the “*” was used to identify codes that were added after the initial code table was constructed – as per the code convention described in section 5.4.2. The codes used during the analysis that described the use of data are shown in Table 5.10. Issues facing small businesses with regard to data which were identified during the coding process include: difficulty with access to sources of data that reside in silos inside their client’s organisations; data quality is often an issue when sourcing external data as there are varying levels of consistency applied by those capturing that data; or the data required is simply not available. Some of the respondents identified the need to ensure the reliability and validity of the data sources but this was not a general theme among all the respondents.

Table 5.10 – Codes used for coding “data”

Code
data
data as a service*
data: access*
data: blending*
data: digest*
data: not available*
data: quality*
data: relevance*
data: scientists*
data: use
data: validity*

“**People**” {people; peoples; person; personal} had the second highest word count. Discussions about people were coded using a single code “people”, but additional codes were assigned to elaborate the context of the discussion. These codes are listed in Table 5.11. The highest three co-occurring codes with people demonstrate the importance of people as resources for small businesses, and a number of instances were identified where these business were constrained in their lack of human resources. This is discussed in further detail under section 5.7.4.1. In addition, the culture family {culture, fit, induction training} and its effect on people was also discussed at length, confirming its role as proposed in Research Proposition 1. A full discussion of culture and its importance can be found in section 5.7.1.3 of this chapter.

Table 5.11 – Codes occurring most frequently with “people”

Co-occurring code	People
Resources	33
*culture family {culture; fit; induction training}	16
effect:: constraint	10

The “**client**” {buyer; buyers; client; clients; customer; customers} was identified inductively as a theme during the transcript analysis and was not originally considered during the compilation of the interview guide. The client is an important source of information for these organisations; they use the client feedback to ensure they tailor their product or service to meet their client’s **needs** (item five in the list). There is a split in the focus on clients between the MDs and Non-MDs, which is shown in Table 5.15 in section 5.6.2 below. This is weighted towards the Team Leads (Non-MDs) who are operationally focused on ensuring client delivery and for whom “client” is the highest occurring word, which can be seen in Table 5.16 in section 5.6.3 below.

The codes used to describe the respondents’ statements on their customers are shown in Table 5.12 below. Both of the team leaders described how these small businesses are

compelled to educate their larger clients on the potential uses of big data, though specifically in their areas of expertise – social media and sentiment analysis. This illustrates the ability of some small businesses to leverage an opportunity to focus on a niche, gain expertise and then commercialise that opportunity by selling that knowledge to their larger clients. Understanding the needs of their customers and listening closely to customer feedback was identified by a number of the respondents as a necessary part of ensuring that they added value to their customers. For example, one respondent (GB), a Managing Director in the mature group, stated that for their business, “...reputation is key. If not 25%, then more, of your business comes from word of mouth.” This quote illustrates the importance of being able to source and monitor information on what customers are saying for these small businesses and could be a potential push factor driving small businesses to adopt big data analytics.

Table 5.12 – Codes used for coding “client”

Code
customer: education*
customer: experience*
customer: feedback*
customer: maturity*
customer: needs*
customer: relationships*
customer: service*
customer: value add*
customer: word of mouth*

“**Time**” {times; times; timing} occurred in the context of being a resource – not having enough time available; evaluating events over time; or with questions of “...can you tell me of a time when...?”; and lastly when discussing the difficulty of timing when to adopt new technology or to build a new feature. Time was identified with a single code “time”, but happened most frequently in the context of other codes, which are shown in Table 5.13.

Table 5.13 – Codes occurring most frequently with “time”

Co-occurring code	Time
decision-making	5
effect:: constraint	5
EO: risk-taking	4
resources	4

“**Decision**” {decided; decision; decisions} was mentioned while discussing how the business made decisions, what those decisions were based on or discussions around difficult decisions that the respondent had had to make and how they went about it. The codes used while coding decision-making are shown in Table 5.14. It can be seen from

the codes used that there are instances of both intuitive and data-driven decisions found in the transcripts, and a full discussion of those findings can be found in section 5.7.1.2.

Table 5.14 – Codes used for coding “decision-making”

Code
decision-making
analytics
dashboards
data
evidence
metrics
numbers
reports
experience
intuition
opinion

In reviewing the most frequently occurring words across all the transcripts, it was found that no relevant themes were identified that had not already been accounted for in the coding table. To provide an element of depth to this analysis and to look for comparisons across the two major respondents groupings used throughout this report, namely by role (MD vs Non-MD), the word counts are discussed next in the context of those two groups.

5.6.2 MD vs non-MD group

The most even split in the respondents is by their reported positions in the organisation (five to four). Table 5.15 shows the word counts per group, with the MD group on the left and the non-MD group on the right.

Table 5.15 – Word group count top ten – MD compared to non-MD – ordered by frequency

MD	GB; RV; BL; JA; FM	Non-MD / other	SC; DT; RJ; AT
Group Word	Count	Group Word	Count
People	188	data	316
Data	183	client	200
Time	117	people	134
Client	106	analytics	89
Decision	81	time	80
Market	77	new	72
Need	77	need	66
Software	72	tool	65
Product	70	insurance	61
Year	69	information	59
		decision	59

* “information” and “decision” share the same count – therefore 11 results for the Non-MD group

When comparing the MD and non-MD group, a different picture emerges to that of the respondents overall. The largest difference occurs with the words “**data**”, “**client**”, “**people**”, “**market**” and “**analytics**”. The fact that the MD group mentioned people as often as they did suggests the importance of people as a resource to the MD and the role that people play in their organisation’s culture. The word “market” covers topics such as understanding their market, what market segments they were focused on and what sources of information they use when understanding their environment. This could also be because the MD needs to set the strategic direction of the business and has to have the most balanced view of internal (“people”, “product”, “software”) and external (“client”, “market”) factors. “**Tool**” and “**analytics**” do not feature in the MD group and “client” was the second highest term for the non-MD group, and was mentioned almost double that of the MD group. This may be due to the make-up of the non-MD group and their role in the business, which is discussed next.

5.6.3 Non-MD group

Within the non-MD group, there are two distinct sub-groups, as shown in Table 5.16. The **CTO vs Sales and Marketing** sub-group shows a technical vs non-technical view. RJ (Mature) and AT (Stable), while both EXCO members, represent different functional areas within their organisations and have very different industry and technology focuses. Both primarily discussed “**data**”, but thereafter they have different perspectives.

RJ’s (Chief Technology Officer, Mature) organisation consults across industries and the interview focused predominantly on big “**data**” “**analytics**”, “**traditional**” “**analytics**” and their “**people**”, which are seen as critically important to them as a professional services firm when dealing with their “**clients**”. RJ also provided insight into a number of “**new**” technologies and the “**problems**” with some approaches.

AT (Sales and Marketing Director, Stable) was focused on the “**insurance**” industry and used “**data**”, “**technology**” and “**solution**” to describe the organisations offering to their insurance “**clients**”.

The **Team Leader (Digital Marketing / Social Listening)** sub-group, which consists of DT (Start-up) and SC (Stable), share similar roles, operate in the same industry and provide the same service to their “**clients**”, the primary focus in their conversation. Their use of big data analytics is not for themselves and their own organisations but they provide “analytics-as-a-service” for external parties. They are both very operational as they are responsible for service delivery and the interviews focused on “**tool**” use and what “**analytics**” they do on behalf of their clients.

Table 5.16 – Word group count top ten – non-MD group – ordered by frequency

Sub-Group 1 CTO vs Sales and Marketing				Sub-Group 2 Team Leader			
RJ	CTO	AT	MKT	DT	TL	SC	TL
Group Word	Count	Group Word	Count	Group Word	Count	Group Word	Count
data	159	data	76	client	65	client	75
analytics	49	insurance	57	data	51	people	48
people	47	perspective	35	tool	34	report	33
client	34	product	27	campaign	29	social	32
new	27	client	26	people	29	data	30
need	24	decision	24	analytics	24	time	25
traditional	22	technology	22	space	21	platform	24
problem	21	system	19	media	20	listen	21
time	19	solution	19	time	19	manage	21
set	19	obvious	19	different	18	new	20
				decision	18	space	20

Conclusion: By role

From the word counts discussed above, it can be seen that there is a difference in focus between the MD and Non-MD groups:

- MDs are more concerned with their people and culture than the non-MD group and they have to maintain a balance between an internal (people) and external (market; client) view. This focus on culture supports the proposition that leaders have an individual influence on operationalising the culture in their business. Human resources were also mentioned as being a constraint in certain instances.
- The non-MDs have a more specialist and operational role, which means that they focus more on what they need to deliver to their clients, especially the Team Leaders.

Data and its role in decision-making featured heavily in the transcripts of both groups, and there were instances found of decisions made based on evidence and using intuition.

Clients and their importance to the Team Leaders was discussed, as well as the finding that, from an MD's point of view, managing reputation (word of mouth) may be a potential driver of the adoption of big data in small businesses.

Where it is relevant to the analysis of the themes, results will be highlighted by group to provide a contrasting point of view.

5.7 Transcript thematic analysis

For the sake of clarity during the analysis, the meanings of the terms used during the researcher's analysis are provided here. A code occurrence is a count of the number of quotes that an individual code has been allocated to. A code co-occurrence occurs when two codes overlap, in that they are both allocated to a particular quotation, or to overlapping quotations. A count of the number of times this occurs is shown with a code co-occurrence table. Finally "share of voice" is a count of the number of words contained in the quotations that a code has been allocated to, which illustrates the amount of time a respondent spent speaking about that concept or topic and therefore the importance they attach to that topic.

The propositions made in Chapter 3 have been repeated at the start of each section for ease of reference. The findings per proposition begin with a discussion of the results per theme, evidenced by code occurrences, co-occurrence and share of voice where relevant, and then a "thick description" of the findings using selected quotes from the respondents.

5.7.1 Research Proposition 1

There are two main factors that drive the successful use of big data in small businesses:

Research Proposition 1.1

The decision-making culture of the business must support the use of evidence in decision-making, otherwise there will be no support for the use of big data analytics in the business.

Research Proposition 1.2

A small business must have a leader (founder / owner / MD) or management team that displays high levels of entrepreneurial orientation, specifically with regard to the elements of:

1. innovativeness
2. risk-taking
3. proactiveness.

Innovativeness and risk-taking are required if a business with constrained resources were willing to invest in new technologies or skills. Proactiveness is required if a business were to actively seek to understand its environment and look for opportunities to exploit.

5.7.1.1 Coding for Research Proposition 1

From the conceptual model proposed during the literature review in Chapter 2, three main themes were extracted and used as lenses to look through at the transcripts for the discussion of Proposition 1, namely decision-making, culture and entrepreneurial orientation.

While coding for decision-making, the researcher was looking for descriptions of the use of formal metrics, reports and dashboards during any form of operational or strategic management forums or meetings, as well as any instances where respondents expressed a preference for evidence, numbers or data rather than experience, intuition or opinion.

The culture of an organisation was looked at from the point of view of “how we do things around here”. While culture is typically an attribute of the organisation, in a small organisation the influence of the leader (founder / owner / MD) in determining the company culture is pronounced and operationalised from the top-down.

In the last part of the first interview the respondent, GB, made the following statement:

“The hardest thing is getting competent people who fit into the business...It’s very, very hard, to the point where we now almost solely recruit from the graduates from university and we train them up in our way of doing things and our way of thinking and they typically prove to be very successful” (GB, Managing Director, Mature, **emphasis added**)

During the transcription of the first interview, the researcher felt that this added a new dimension to the role of culture than what was envisaged during the literature review, and the construction of the conceptual model. Where employees work closely with one another in small groups, an individual can have a pronounced effect on the people around them and it is important for the cohesion of the business that people “fit” in. How groups encourage fit, through some form of training or induction, speaks to “how they do things” and how members of the group are encouraged to act in a similar way. In this case, how they make decisions and what they base those decisions on, and if they behave in an entrepreneurial manner. For this reason, the researcher looked for descriptions of how the leader maintained the culture in the organisation over time and what the consequences were of people exhibiting behaviours that made them not fit. The interview guide was updated to add questions around fit and any induction training or process.

Lastly, the three specific elements of entrepreneurial culture were looked for, namely innovativeness, proactiveness and risk-taking, and for situations of how these three elements were balanced against a limited resource base. It was proposed that innovativeness and risk-taking are required if a business with constrained resources were willing to invest in new technologies or skills and proactiveness was required if a business were actively seeking to understand its environment and looking for opportunities to exploit. Given the aforementioned impact that the leader has on the culture of the business, it should be possible to use the entrepreneurial culture of the individual as a proxy for their organisation.

During the analysis of the transcripts, the following codes were used to identify elements relevant to and in context of culture, entrepreneurial orientation, decision-making and the use of evidence (or not) in that decision-making.

Table 5.17 – Codes used for decision-making (evidence vs intuition), culture and EO

Decision-making	
analytics <i>decision-making</i> dashboards data evidence metrics numbers reports	experience intuition opinion
Culture and Fit	
behaviours culture fit induction training	
Entrepreneurial Orientation (EO)	
EO: innovation EO: proactiveness EO: risk-taking	

5.7.1.2 Decision-making: The evidence for Evidence

Research Proposition 1.1 focused on how the organisation goes about making decisions, as evidenced by the leaders of the organisation. The concept of decision-making was coded in all but one of the interviews – that of SC (Team Leader, Stable). This is most likely due to SC's operational role, which requires them to focus on ensuring that the analyst in their team completes their assigned tasks and delivers on time to their clients, as evidenced by this quote:

"I was totally focused on those clients and what their needs are and what is happening internally around addressing their month-on-month and daily deliverables, around particular clients." (SC, Team Leader, Stable)

This did not leave them the scope to be involved in any decision-making beyond what was needed to do to ensure that delivery. SC said that they were resource constrained and had to “churn, churn, churn” from the “little box” they were put in.

“...because the teams were so small there was not that much capacity for us to explore other opportunities...So the head of social listening is the one that is responsible for new business and strategy development and all of that stuff. Yes. So essentially everyone else would not have any time to investigate new opportunities, you just had to churn, churn, churn, and with the high volume of clients that we had it was very difficult for us to look out of the box that we were put in.” (SC, Team Lead, Stable, emphasis added)

This suggests that those at an operational level are constrained in their ability to make strategic decisions, and have to focus rather on keeping their customers happy.

Table 5.18 shows the occurrence count of the code “decision-making” for each respondent, ordered from highest to lowest.

Table 5.18 – “Decision-making” code per respondent – ordered by occurrence

Code	GB	FM	BL	RV	(JA)	(RJ)	(DT)	(AT)	(SC)
decision-making	14	11	8	8	7	7	6	3	0

Table 5.19 shows the share of voice of quotes identified as being relevant to “decision-making” for each respondent, also ordered from highest to lowest.

Table 5.19 – “Decision-making” code by share of voice – ordered by relative share

Code	BL	JA	GB	RV	FM	RJ	DT	AT	SC	Total
decision-making – word count	1393	898	928	781	733	707	336	203	0	5979
Total word count	8953	6336	8692	8031	10292	9843	7304	7736	7607	74794
Relative count (%)	15%	14%	10%	9%	7%	7%	4%	2%	0%	7%

It is clear from both Table 5.18 and Table 5.19 that the MD group account for the majority of the instances of “decision-making”, from both a code occurrence and share of voice viewpoint, as they make up the top five in both tables. In contrast, DT and SC, the two team leaders, are in the bottom three and this supports the contention that the MD of the organisation will have a more pronounced impact on the way decisions are made in an organisation than those on a more operational level.

Respondent's perception of data and numbers vs opinion and intuition (gut feel)

Of primary concern to Research Proposition 1.1 is how the respondents viewed making decisions based on evidence. Of the respondents:

- Five expressed a preference for using evidence, four of which were in the MD group;
- Two stated that while evidence was important, there were situations where it was necessary to consider both opinion and gut feel when making decisions;
- One was ambivalent about the use of data and opinion; and
- One was not coded for decision-making.

This preference for using evidence may be a learnt behaviour, either through education or as a function of experience – as can be seen from the quote by JA below and the discussion on the respondent's education in section 5.5.2, although there may not be enough information available in this research to conclusively support that conclusion. Table 5.20 shows the preference per respondent.

Table 5.20 – Respondents' view of evidence in decision-making

View	JA	GB	BL	RV	DT	RJ	FM	AT	SC
Evidence	X	X	X	X	X				
Evidence, but...						X	X		
Ambivalent								X	

To support the above findings, the following quotes will illustrate the respondents' approaches to decision-making.

JA's (Managing Director, Mature) view on using evidence (data) in decision-making was that they had, over time, become better at using data to make decisions, and where they did not have any data they would design an experiment to generate it:

*"I think progressively **over the years we got better at using data to make decisions. In the beginning we would make a lot of decisions just sort of based on gut or people's personal preferences. But over time we got better and better at, whenever we wanted to make a decision, to work out some sort of mechanism to try and collect data – whether it be through AB testing or something that we could do to validate or at least form some sort of hypothesis, design an experiment to test that hypothesis, run the test, look at the data, either confirm the hypothesis or show it not valid, and then continue on that process.**" (JA, Managing Director, Mature, **emphasis added**)*

JA went further to state that over time they had actively discouraged opinion, which otherwise resulted in endless debates in their organisation.

*"The last few years we got to the point where **we didn't want to make decisions based on opinions** because we would have a variety of different opinions and any decision based on **opinions would just result on an endless debate that goes nowhere.** So we became more and more disciplined over time to be able to use data, **to make data-informed decisions rather than just opinion based decisions.**" (JA, Managing Director, Mature, **emphasis added**)*

GB (Managing Director, Mature) was very focused on numbers and most of their quotes referred to numbers, hence the high “number” code count in Table 5.18.

“I am a numbers guy.”

*“**What percentage do we think we could corner of that market?** So that we’ve got a feel for the **kind of revenue numbers** that you could generate from that software product.”*

*“This is **what we think the value of these features sets were** and this is the effort and the cost that goes into developing that **so we can do a cost benefit analysis of each release** that we come out with.”*

*“...after the strategy sessions we would go away and then I would research to say **do these numbers make sense?**”*

*“**It was a numbers decision.** It was the cost of development versus the revenue streams for the insurance management software were years in the coming.”*

*(GB, Managing Director, Mature, **emphasis added**)*

BL (Managing Director, Stable) was unique in that they have gone to the extent of defining a formal process of how they make decisions in their organisation. In illustrating how they used their process, they referred to an example of staff morale, which further illustrates the importance of people to the MD.

“We follow a specific problem solving technique at [anonymous] which we call: AD, ID, CLD”

*“I have a system’s world view. **I believe that everything operates as a system**, and I consider [anonymous] to be a social system. I feel **that my role as the leader** of [anonymous] **is to make sure that all of the variables that are in the system are interacting well**...Each of those variables have to operate with in envelopes of acceptability. **So staff morale**, for example, **would be a qualitative variable** which we could frame as either low or high. **Profit would be a quantitative variable**, which would have an envelope of acceptability...**So I kind of view my business as a big causal loop diagram** and if any of those variables starts to exhibit undesirable behaviour I want to identify the variable that is actually driving that...**Now over time these variables will display behaviour** and they are all acting on each other. **So if through the use of big data I can quantify all of my variables at regular intervals in time as soon as one variable starts to go outside of, or heads towards being out of, the envelope of acceptability. I can very quickly conceptualise what effect that is going to have on my other important variables** – but the important thing is to have these values updated at regular time intervals.”*

*(BL, Managing Director, Stable, **emphasis added**)*

For RV (Managing Director, Start-up), measuring activity on their website was crucial for them to understand how the changes they made affected the users’ experience and they also made use of experimentation to generate data.

*“So we determine our help by seeing the amount of (pause) and that is maybe where you would like to touch on is we measure (pause) if you forget about the software integration and just the platform **we measure everything**. So we measure how many users come in and how many new users and from where they come in and the amount of time they stay on the page and how many pages they go to. **We do a whole Google analytics and we track it bi-weekly and every time a change comes in you mark it to see what happens.** So **we will do quite a lot of AB testing**. One of the measurements we’ve got as a **critical value is the amount of new users coming to the site** and ... if one of those four in percentage grow to the previous month there is a flag going out and then the amount of time the user spends on the site is another thing... **If we see there is a drop in time spent we know there is a user experience problem at certain points that they hit a dead end and we need to make another call that they can go further. That is what we sort of measure now in big data** if I can say it like that.”*

*It is really how people interact with our platform and how often they interact and what they do with it.” (RV, Managing Director, Start-up, **emphasis added**)*

These quotes demonstrate the finding that four out of five of the members of the MD group stated a preference for using evidence in their decision-making, with one actively discouraging the use of opinion in their organisation. This is evidence of the impact of the leader on the decision-making culture of the organisation.

Of the Team Leader group that was coded, DT stated that evidence was required when looking to obtain resources from the management of their organisation for the new team, and that without evidence to support their request, they were unlikely to be successful.

*“Always, because usually I need to convince someone else to give me some budget because at the moment the way that we are structured it is a horizontal discipline. It is not a standalone offering, which means I always need to go and convince someone to give me budget and no one will just give me budget just because it sounds like a good idea to me. There always needs to be some sort of moderation, whether it is about hiring new person, using a new tool, all those kinds of things, actually it is never a quick process...but I think in those kind of situations it is also **always better to have it backed up by something and it would never just be experience.**” (DT, Team Leader, Start-up, **emphasis added**)*

There was some contrary evidence found, which supported the use of intuition and gut feel under certain circumstances, despite a general preference for evidence expressed by the two respondents. One respondent was ambivalent regarding a preference of evidence.

For FM (Managing Director, Mature), the context of the data and the emotion of the “user” (customer) is important. This illustrates that an element of judgment must be brought to bear when looking at the evidence.

*“Well I think the big data, its one thing is... **opinion is a vital component of big data because at the end of the day who is the user? He’s a human** and there is one thing... and I think it is going to be an interesting challenge going on, **everyone is getting sucked up into this data and yes statistics don’t lie. But statistics don’t allow for context and emotion.** If you are in the retail space you have to consider that stuff. And data doesn’t do it – **so data will give you 80% or 70%.**” (FM, Managing Director, Mature, **emphasis added**)*

FM elaborated further:

*“I will give you an example. If we look at data and performance of a dealership and his listings and where we say a good listing is twenty photos and whatever other stuff. **You have a look at the context of the photos. Data will tell you there were ten photos/twenty photos or whatever, but it won’t tell you that they are all the same or they were out of focus or there was not purpose of the twenty photos.** Whereas a human will come along and bail but the dealer is going to say, going on data my listings are perfect because I put twenty photos*

*in and I got 100% for my comments, why? Because we are measuring data. **So many characters make up comments** because you can't contextualise a comment even if you read it; **what is the relevance to it.** Going on crude data the dealers would turn around and say, well my listing is perfect. **Sure, statistically or analytically it is – but contextually and emotionally it is nowhere. You've got to bring that element into it and opinion does that...**The reality is **one has to be cognisant of who we are dealing with** at the end of the day. **It is a human being.** They will continue to behave as human beings do.” (FM, Managing Director, Mature, **emphasis added**)*

RJ (Chief Technology Officer, Mature) states that an element of experience and “gut” is relevant to trends and decisions that deal with the unknown, having been in the industry for a long time. He felt that to look at everything from a purely quantitative point of view “left a lot on the table”.

*“But then that also turns into **more of a gut feel decision around, okay these are the trends we are sensing.** Being in the industry for a long time there is **still that element of gut** that comes into it. I seriously... I firmly believe that **to try and do everything quantitatively you leaving a lot on the table.** There is **an element of experience and gut that has to come into looking at the unknown** – what is going to happen? You have to take those bets and take chances, things like that. **Obviously making the decision based on rich data assists in that kind of decision-making process, but you do have to have both.**” (RJ, Chief Technology Officer, Mature, **emphasis added**)*

This contrary finding illustrates that there are situations and contexts in which solely relying on data may not be appropriate and that there are other sources of information that may need to be considered, such as experience and the human ability to interpret images (photos).

Conclusion: The evidence for Evidence

Five of the nine respondents interviewed during this research expressed a clear preference for making decisions based on evidence, with a further two stating a preference for evidence but with a caveat that intuition and experience still play a role in decision-making.

From a role perspective, four of the five members of the MDs group expressed a clear preference for data, with one (FM) stating that while data provides 70 to 80%, it cannot account for the emotions and context of the user. Given what is known about the education of the MD group, it would appear that education may also play a role in the preference of the individual for using data in decision-making.

In the Non-MDs group, one operational individual (SC) was not coded for decision-making, one (AT) was ambivalent, while the other two supported the use of data in decision-making. From RJ's perspective (Chief Technology Officer, Mature) there are

situations where data is not available and gut feel and experience must play a role, such as looking forward to the “unknown”. In contrast, two MDs stated that they would generate data using experimentation if they did not have any, with one of these MD actively discouraging the use of opinion in making decisions, highlighting the impact of the leader in the decision-making approach in the organisations.

The above findings therefore support the proposition that businesses that are currently using big data analytics prefer to make decisions using evidence.

5.7.1.3 Culture: How important is it?

The focus for assessing culture and its importance in terms of fit in an organisation was kept to the espoused values of the respondents, or what people say the reason for their behaviour is (Schein, 1984). Obtaining evidence of the artefacts and underlying assumptions of the respondents would typically require visiting each respondent at their place of work. An additional interviewer will need to act as an observer during the interview to record the respondent’s body language and response (where they become uncomfortable or defensive) to the questions about culture (Schein, 1984). This was not practical, given that the researcher was working on their own and two of the respondents were based in Cape Town, hence the focus on the espoused values.

Respondents’ perception of culture

Upon analysis of the transcripts, it was found that for the respondents of this study:

- Culture was most important to members of the stable and mature groups.
- Most of the MDs in the stable and mature groups related how they ensured their new staff fit in the organisation by using some form of induction process or training, or by employing mostly graduates and young people who they could then train in their way of thinking. This demonstrates the importance of culture to the leader of the organisations.
- The members of the start-up group were either focused on training their new employees on the use of a tool or they relied on contracts for the majority of their staff. This may suggest that they have not had time yet to establish a firm culture in their team or organisation.

Table 5.21 shows the number of occurrences for each of the three codes per respondent and is ordered from highest to lowest. GB (Managing Director, Mature) and BL (Managing Director, Stable) are clearly outliers, with 24 of the 38 codes applied in their transcripts.

Table 5.21 – Codes for culture per respondent – order by occurrence

	GB	BL	SC	AT	DT	RJ	JA	RV	FM	TOTAL
behaviours	3	4	2	0	0	0	0	0	0	9
culture	8	4	0	1	0	1	0	0	0	13
fit	2	3	2	2	2	1	2	1	1	16
TOTAL	13	11	4	2	2	2	2	1	1	38

To validate this result, the share of voice was queried for the same three codes and a clearer view of the data emerged, which can be seen in Table 5.22. It can be seen that the depth of the discussion is more even among the top six; three of whom are Managing Directors and all of whom are either stable or mature. The low ranking of the start-up respondents, DT (Team Lead) and RV (Managing Director), may be due to the fact that their organisation is very new and they have not yet had time to establish a firm sense of culture, unlike the mature and stable respondents who appear in the top six. What is also evident in Table 5.22 is the amount of time given by the respondents to discussing “fit”, which is double that of “culture”. This finding supports the contention made above of the importance of employees fitting in a small business, especially in stable and mature organisations, and is further expanded on below.

Table 5.22 – Codes for culture by share of voice – ordered by relative share

	GB	RJ	SC	BL	JA	AT	DT	FM	RV	TOTAL
behaviours	132	0	84	255	0	0	0	0	0	471
culture	307	333	0	152	0	10	0	0	0	792
fit	110	333	324	126	206	223	117	193	48	1680
Accumulated word count	549	666	408	533	206	233	117	193	48	2943
Total word count	8692	9843	7607	8953	6336	7736	7304	10292	8031	74794
Relative Count (%)	6%	6%	5%	5%	3%	3%	1%	1%	0%	3%

SC (Team Leader, Stable), the only respondent who is not an EXCO member and who had no codes relevant to decision-making assigned, is represented in the top four in terms of share of voice on culture. This may support the view that culture is set from the top and reiterates the role of the leader, as the organisation had induction training and a high number of processes that were strictly followed. This finding is further elaborated on at the end of section 5.7.1.4 on entrepreneurial orientation.

When the importance of culture in their organisation was discussed, the respondents ranked it as either “critical” or of “high” importance, with no one ranking it of “low” importance, as can be seen in Table 5.23.

Table 5.23 – Importance of the culture codes

	behaviours	culture	fit
importance:: critical	0	1	2
importance:: high	1	4	4
importance:: low	0	0	0

During the discussion on culture, none of the respondents who evaluated culture and its role in their organisation felt that it was easy, nor were any ambivalent, as evidenced in Table 5.24. Table 5.24 also shows that there were instances where respondents found it very difficult to judge a new employee’s fit, typically requiring a period of time before they were able to tell.

Table 5.24 – Evaluation of the culture codes

	behaviours	culture	fit
evaluate:: easy*	0	0	0
evaluate:: challenge*	0	0	0
evaluate:: difficult*	0	0	4
evaluate:: ambivalent	0	0	0
evaluate:: negative	0	0	4
evaluate:: positive	0	0	3

During the first interview, when asked what the one thing would be that they would change in their business if they could immediately solve it, GB (Managing Director, Mature) responded that getting people that fit was the hardest thing. However, by training new graduates in “their way” and encouraging certain behaviours (attitudes), the staff were more successful and this culture allowed them to be more agile and deliver solutions to their clients more quickly. This further evidences the importance of the culture to the MDs in this study.

*“...probably the hardest thing – look getting new business is always hard, but it is not the hardest thing. **The hardest thing is getting competent people who fit into the business...It’s very, very hard, to the point where we now almost solely recruit from the graduates from university and we train them up in our way of doing things and our way of thinking and they typically prove to be very successful**”*

*“...what we push with the guys is that firstly you **have to have a can do attitude** – nothing must be too difficult and **if you see a problem, own it and fix it**. Don’t go around whingeing and bitching, or making it somebody else’s problem...**because we are a small company...everybody is expected to get down and if the dishes are dirty you wash dishes...**”*

*“...it means we know we can – **if a customer wants something different in the software we can deliver that very quickly...** and we do listen to what they say and we do try and give them what they want very quickly.”*

*“We have in the past employed **people who have never been in the software game before and it’s like they are from a different planet** almost.”*

*(GB, Managing Director, Mature, **emphasis added**)*

During the second interview, JA (Managing Director, Mature) related a similar approach of hiring more junior people when they were unable to find the right fit. However, this was not always possible due to time constraints, potential missed opportunities and an overload of work, which forced them into a position where they had to employ someone they otherwise would not have.

*“I think **it is difficult, we struggled to be honest. For a long time we couldn’t find the right people so we ended up employing more junior people...**But yes it was always a struggle to find the right people and **even sometimes you thought people would be a good fit and then they ended up not being a good fit...**It is difficult right, because **you sit with the constraints, you need more people to develop the system faster and yes this is what you would ideally want but sometimes you could search for six months and not find that and then what do you do?...Unfortunately sometimes we ended up with people who probably should never been there but it was out of desperation** because we couldn’t find anybody else.” (JA, Managing Director, Mature, **emphasis added**)*

*“So **we would employ more people that were relatively young and junior without experience** and then sort of **let them work there for a year or two** and then out of that pool identify the people that we would know would stay long term and **make sure we looked after them**, and some of the others would come and go and some would develop a little bit later.” (JA, Managing Director, Mature, **emphasis added**)*

The approach by these two MDs in the mature group of recruiting young people with no experience is evidence of their method to ensure that their preferred culture is operationalised in their organisation.

Looking across the remaining interviews, three other respondents experienced similar issues with regard to fit. SC (Team Leader, Stable) related that while it was difficult to determine fit upfront, they made use of their big data tools to research and vet new employees before they joined, which helped.

*“Yes, **it is definitely tough**, there are a couple of people, **you never recruit the right people, over time you do realise that these people aren’t a good fit for the work that we do, but most of the people that we did get were the right fit. As a digital agency we did a lot of cyber snooping, check their profiles**, what kind of stuff are they engaged with, **what do they talk about, and that does help to a certain extent**, but there are things that you don’t know about people.” (SC, Team Lead, Mature, **emphasis added**)*

BL (Managing Director, Stable) is again unique among the respondents in that not only do they have a formal decision-making process, but they also have a formal meeting to discuss their organisations culture and values.

*“And then the third meeting we have is what we call our policy and values meeting where then we look at policy, **we look at culture, we look at values and ethics.**” (BL, Managing Director, Stable, **emphasis added**)*

Despite this, BL also felt that it was difficult to assess fit upfront.

*“**Well I mean it’s tough**, you only really know if you have employed the right person within a few months after having employed him.” (BL, Managing Director, Stable, **emphasis added**)*

RJ sees culture as critically important and stated that they will personally participate in almost all the interviews of new staff. It is also worth noting that RJ’s organisation had gone as far as setting up a subsidiary that focused on scarce skills recruitment, which implies they are proactively looking to ensure they have access to a source of specialist resources.

*“We have a very (pause) **we see talent acquisition as a strategic function. So culture for us is critically important. So in 99% of the interviews or the recruitment process we do it at representation from EXCO level as well as from MANCO level....in actual fact...I interview most people because we believe it is such a critical function. So the types of people we look for is... we interview for culture and passion primarily and then skills and capabilities, while important**, depending on the level and position we are interviewing for, **are less critical.** So do people have the right attitudes?” (RJ, Chief Technology Officer, Mature, **emphasis added**)*

From the quotes above, it can be seen how important culture is to the majority of the respondents and the difficulty that having employed the wrong fit of person presents. Having established that culture is important, especially to the stable and mature MDs, one needs to ask what mechanisms were used by stable and mature organisations to try instil that culture and ensure that new members fit, thereby managing that difficulty?

Of the seven mature and stable respondents, four had some form of formal induction training and processes and one had assigned a mentor to new staff.

*“Ya, we’ve **got quite a strict process** there where they firstly have to learn the product so we have-- they attend the normal training that our customers would attend and then they have to sit on the service desk and support the product **and we have accreditation...takes at least 3 months probably to do induct somebody**” (GB, Managing Director, Mature, **emphasis added**)*

*“Yes. So we run a, let’s call it **initial two day induction.** Then we’ve got... let’s call it a type of **shadowing process to get people into the functions that they are in.** So we do land them. It is a controlled landing. We don’t just sink or swim the people” (RJ, Chief Technology Officer, Mature, **emphasis added**)*

*“Over time we worked together very closely with the people we employ and **went through rigorous induction process and training process** and we would recognise what their strengths and weaknesses are and leverage their strengths.” (SC, Team Lead, Stable, **emphasis added**)*

There is an induction course or programme basically that we take guys through. Obviously in their respective fields and holistically taking the guys through what the organisation and the business is all about. (AT, Sales and Marketing Director, Stable, **emphasis added**)

“We don’t have an induction process, they just pick it up, and we provide training and (trails off)... they get given a mentor and they will just hit the ground running and learn as they go.” (BL, Managing Director, Stable, **emphasis added**)

FM (Managing Director, Mature) did not discuss a form of induction process and JA (Managing Director, Mature) was able select from a pool of young staff and look after them to ensure they remained in the organisation (please see the JA quote above for evidence of this).

Among the start-up group, DT (Team Leader, Start-up) demonstrated the lack of process and the focus on training in the tools that they are using to deliver to their clients.

“Well it’s a bit of both, so there is no formal process and it is usually a hit-the-ground running but because none of them would have... so far no one that has started in this department has ever used any of the tools that we use before. So there is an ongoing course in the sense that they need to be able to work with all those tools so they would need to go through a training, but it’s like training on the job.” (DT, Team Lead, Start-up, **emphasis added**)

RV (Managing Director, Start-up) made use of mainly specialist contractors, which actually outnumber their full-time staff, as this gives them the ability to control their limited resources.

“Because it is very high end programming we use contract based staff. So we about (pause) I am going to lie to you (pause) five/four permanent employees and then anything between seven and eight contractors onsite or being used... one of the big reasons why we do that, because I am not sure if you developed or developing yourself but it is a breed on their own and we have burnt our fingers too much so that is why we stay with a project based contract. If the guy works for a salary we tend to see that for the first month or two they are very good and thereafter it is just they take on other work and you can’t control it.

The start-up group did not present any evidence therefore to contradict the findings regarding the mature and stable groups discussed above.

Conclusion: Is culture important?

Given the level of experience represented by the members of the stable and mature group and the fact that three of the four Managing Directors in the mature group spoke at length about culture and fit, there is evidence that culture is important and that the influence of the leader on the culture of the organisation is pronounced. The tendency to use and commercialise data then comes from the top. It is more impactful and

resonates throughout the organisation if led by management. SMMEs then could be better placed to effect change towards data use as the founders can make themselves felt in a greater and more significant way. This makes understanding the entrepreneurial culture of the leadership of the organisation relevant to understanding the role that culture and entrepreneurial orientation have on the use of big data.

5.7.1.4 Entrepreneurial Orientation (EO)

Research Proposition 1.2 suggests that innovativeness and risk-taking are required if a business with constrained resources were willing to invest in new technologies or skills. Proactiveness is required if a business were to actively seek to understand its environment and look for opportunities to exploit.

Having established the importance of culture to the leaders of the business and the effect that an individual leader can have on the organisation’s culture, we now turn to looking for evidence of an entrepreneurial culture in an organisation, using the individual leader as a proxy. It was found was that the majority of MDs and the CTO showed elements of EO in their transcriptions, the evidence of which is shown below.

EO was coded for proactiveness, innovativeness and risk-taking as per Table 5.25, which shows the occurrence count for each of the three codes used by respondents and sorted from largest to smallest, with MDs making up the top three.

Table 5.25 – “Entrepreneurial orientation” codes per respondent – ordered by occurrence

Codes	BL	FM	JA	SC	RJ	GB	AT	DT	RV	TOTAL
EO: innovation	6	6	7	4	5	1	3	3	1	36
EO: proactiveness	13	10	6	7	5	5	3	2	2	53
EO: risk-taking	4	7	4	2	2	3	1	2	2	27
TOTAL	23	23	17	13	12	9	7	7	5	116

This is corroborated by looking at EO in terms of share of voice. Table 5.26 shows that three of the top four occurrences are MDs. One respondent in particular, JA (Managing Director, Mature), spent a third of the interview discussing issues related to EO. JA managed to encapsulate their approach to new technology and risk-taking in one quote:

*“What do you define as risk? I mean starting a business is a risk...No, we would **always try new stuff way before we probably should have**; we could have easily been much more relaxed on how quickly we try and adopt newer technologies. But **we didn’t mind, I mean that was part of the fun** and part of the reason all of us was there was because **we wanted to do stuff that was closer to the bleeding edge than what we for all practical purposes would have had to do to survive and thrive. But we didn’t really see that as risk**, we saw that as **part of the experimentation and learning** in what the technologies were and trying to adopt and to...we probably could have been more efficient and spent less money on some of those things but **we felt it was worth the investment** because **a lot of the time experiments like that would lead to stuff that we can actually apply** and would help us generate revenue.” (JA, Managing Director, Mature, **emphasis added**)*

Table 5.26 – “Entrepreneurial orientation” coded by share of voice – ordered by relative share

	JA	FM	RJ	BL	SC	GB	RV	AT	DT	TOTAL
EO: innovation	823	419	501	324	307	85	92	83	87	2721
EO: proactiveness	1027	645	546	487	522	433	195	264	60	4179
EO: risk-taking	294	381	261	315	79	127	167	37	175	1836
Accumulated word count	2144	1445	1308	1126	908	645	454	384	322	8736
Total word count	6336	10292	9843	8953	7607	8692	8031	7736	7304	74794
Relative count (%)	33%	14%	13%	12%	11%	7%	5%	4%	4%	11%

JA also had the highest relative share of voice dedicated to proactiveness and innovation, though comparatively less on risk-taking, a result that was found with most respondents. This suggests that of the three elements of EO, proactiveness and innovation are more important than risk-taking. To add some context to this, it should be noted that JA was the shortest interview – at just over thirty minutes – and the only MD who described their experiences at a business in which they had sold their interests. The last 30% of the interview was focused on the entrepreneurial endeavours that JA was involved in since leaving their previous company and how their learning about the use of data in decision-making had led them to adopt the “Lean Start-up Method”. Now, JA will not invest any more time and resources than necessary in building a prototype “minimum viable product” to test their assumptions about a new business opportunity. This high level of proactiveness and innovation is tempered by JA’s risk management strategy of developing only the minimum viable product.

*“Oh yes, more than ever. I don’t know if you have read **The Lean Start-up?**...So exactly, so the big basis of it is that you want to **test as many of your assumptions as quickly as possible**, so I think what he says is **the purpose of a start-up is to figure up what to build for which market in the shortest period of time...** then you try and do as little work as possible to get to testing each of those assumptions... And I mean we believe in that **almost religiously now, and everything I approach I try and do in that manner** where I try and **break it down to the most fundamental assumption that you are making** and then try and **test that assumption.**” (JA, Managing Director, Mature, **emphasis added**)*

“...there was always lots and lots of data to play with...” (JA, Managing Director, Mature)

Two of the other MDs also mentioned their use of the lean principles in their product development and only investing in the minimum viable product that is needed to test the acceptance in the market. This use of a formal approach to looking for, testing and then exploiting new opportunities demonstrates both proactiveness and innovation, while mitigating unnecessary risk. This suggests that entrepreneurial leaders will find a way to exploit opportunities despite facing constrained resources. This also suggests that small business will most likely find the most efficient way of exploiting new opportunities. BL (Managing Director, Stable), who is ranked first in Table 5.25 and fourth in Table 5.26, said that they accept an opportunity first, and only then think about how they are going to exploit that opportunity.

*“If we get, I am sure you have heard this before, but **if we get presented with an opportunity we say yes and then we go figure out how to do it** and I think most businesses are built like that.” (BL, Managing Director, Stable, **emphasis added**)*

BL explains how they make use of the minimum viable product to understand their clients' needs as clients often do not know what they want. However, by showing them something tangible, they are able to guide them.

*“We had a business plan **and we built what we call a minimum viable product**, which I am sure you have heard of. It was **basically something to go and show the markets because quite often they don't know what they want** and as soon as you can **show them something that is tangible** they can start to conceptualise what they want.” (BL, Managing Director, Stable, **emphasis added**)*

RV (Managing Director, Start-up) related their use of the lean start-up principles in their organisation and also how they balance their current resource availability against the benefit of innovating through a new feature on their product.

*Yes, so **our business is very lean** for the reason, like I said **it is a start-up and we believe in the lean principles**. The guys that are involved we **measure their time very strictly** and we **compare if a new feature is worth doing or not with the current capabilities and resources**. If not we get someone to help us with it. For example, an Android or an Apple app we can do it, but we do (pause) **so we do minimum viable product**.” (RV, Managing Director, Start-up, **emphasis added**)*

RV (Managing Director, Start-up) also described how being resource constrained meant that every decision had to be made in context of their available resources, which may explain why they appear relatively low in the ranking in Table 5.25 and Table 5.26 above.

*“... **if you've got resources available at all time then you are not lean and optimal... resources is always a factor** because it is mainly our expenses is resources...it is every hour you pay for. So yes resources is definitely one of the most (pause) **well every decision gets compared to that**.” (RV, Managing Director, Start-up, **emphasis added**)*

Looking at the other MD who was ranked second in both Table 5.25 and Table 5.26 above, FM exhibited a particularly high level of risk tolerance.

*“I am not interested in mainstream, **we’ve got to be cutting edge...We put it in knowing there is a good possibility the s*** is going to fall over and be prepared to pull it out. But to have the kahunas to do it again, not once bitten twice shy. That is what makes me tick.**” (FM, Managing Director, Mature, **emphasis added**)*

FM furthermore expressed the desire to be proactive and innovative.

*“I suppose at the end of the day **what is key to me is that I am never satisfied. Maybe it is a good trait to keep pushing the envelope along. I look at things and think, well how do we do it better?**” (FM, Managing Director, Mature, **emphasis added**)*

The four MDs above have shown higher entrepreneurial orientation through a combination of the three elements, which together show a higher level of EO. This supports the finding of the need for a leader who is actively demonstrating EO in their approach and, as previously established, can act as a proxy to the rest of the business. When discussing risk, RJ (Chief Technology Officer, Mature), who also stated that they are personally involved in almost every interview and who sees culture and fit as critically important, related the necessity of taking risk, lending further support for the role of the leader.

*“**Lots of times. It is an element we live with.** We have invested in go to markets, we’ve invested in products, we’ve invested in partnerships that... and also customers that have not panned out the way we wanted them to. **You learn hard lessons from those things but you learn the lessons. If you do it again then there is a problem so you do learn lessons. One of the things that you have to watch for is that you don’t become too cautious. You’ve got to have that element of risk taking. What we look at is how do we take risks from a firm foundation? ...We don’t always get it right.**” (RJ, Chief Technology Officer, Mature, **emphasis added**)*

What can be seen from the above quote is that these leaders see the need for some means of mitigating that risk, given their resource constraints. A theme that was inductively identified during the coding of the transcripts was that of experimentation, particularly among the three MDs whose businesses had web-based business models (JA, FM and RV). A web-based platform is an abundant source of data and this allows the MD to “play” with the data (as JA stated) and to look for ways that improve their users’ experience and add value. FM (Managing Director, Mature) illustrates this by explaining that it is easier to experiment in the virtual online space.

*“It is **very easy to get in the game per say in the online space until the commercials kick in. Competitors get traction and you try a few things and they don’t work and you can reverse out of it which is nice. You don’t have to... you don’t build a building... take a year to build and then realise – oops the building is wrong and destroy it. The nice thing with online space is you try something, you put it into the environment and let it run for a week or two and you can pick up very quickly if it is working or not and then you pull it out and go back to the drawing board...**” (FM, Managing Director, Mature, **emphasis added**)*

Both JA and RV, the other two MDs who are in online space, made use of AB testing as a means of experimenting and generating data on which they could make better decisions. AB testing involves create two or three different versions of a page or process on a website and then serving those pages up to equally random groups of visitors to the site and measuring which page has the highest response. This gives them the ability to take what was a subjective design decision and collect usage data that will give firm evidence of which is the best option. This suggests that small business in the online space may have an advantage over those with more traditional business models as they have a ready source of data to use and are more likely to make use of big data analytics.

The co-occurring codes with the three codes used for entrepreneurial orientation (EO) are presented in Table 5.27 (sorted from largest to smallest). The high rate of occurrence of the code **“technology”** in conjunction with both innovation and proactiveness suggests that a number of the respondents in this study are actively engaged in understanding and looking for new technology in their organisations. This suggests that small businesses that are making use of technological solutions are more likely to be comfortable using big data analytics.

Table 5.27 – “Entrepreneurial orientation” co-occurring codes – ordered by total

Co-occurring codes	EO: innovation	EO: proactiveness	EO: risk-taking	TOTAL
Technology	7	11	3	21
decision-making	4	3	3	10
experimentation*	3	5	2	10
time*	3	3	4	10
financial	3	2	4	9
resources	3	3	1	7
agility*	2	3	0	5
competitors*	1	4	0	5
data	1	3	1	5
experience	1	3	1	5

What also stands out in Table 5.27 above is the group of the next three codes: **“decision-making”**, **“experimentation”** and **“time”**, which each has a co-occurrence total of ten. Upon reviewing the instances of these co-occurring codes in the transcripts, it was found that a number of the respondents related that deciding the right time to adopt a new technology required a delicate balance between being too early and facing a low level of adoption versus being too late and losing out on an opportunity in the market. RV (Managing Director, Start-up) described the necessity of judging the right time to develop a new feature.

“They did quite a lot of research and the most important one of all those that depend on whether the business is successful or not is timing, on the online environment. So that is the thing we need to monitor the whole time. If we do a new feature what is the timing, you can’t be second because you’re last but you can’t be first by too long that the market is not ready.” (RV, Managing Director, Start-up, emphasis added)

FM (Managing Director, Mature) described the balance between being too “cowboy” versus being the last out of the block. This also shows that judgment and experience play a role in deciding when to adopt a technology.

“It is not always about being first out the starting blocks and you’ve got to be careful that you don’t go too cowboy, but you also don’t want to be the last one out of the block...it does sort of payoff to be a little bit patient instead of being the absolute early adopter because some things get traction and others don’t.” (FM, Managing Director, Mature, emphasis added)

Three of the other respondents related incidents where they had risked investing resources in developing a new feature or capability that they thought would add value, but that some turned out not to have been taken up or had to be done to please a single important customer. AT (Sales and Marketing Director, Stable) relates:

“We built a feature called a towing solution, which works but it hasn’t been adopted” (AT, Sales and Marketing Director, Mature)

GB (Managing Director, Mature) illustrated the importance of the customer and that what must be considered in deciding to add a feature is wider than just the costs of implementing that feature may bring, in this instance, the potential reputational value (word of mouth).

“We’ve written loads of things that didn’t take off. Every software product you develop there is the risk, ...I am certain there will be feature’s we’ve added that only one person’s using so the value to the market was very low, but the pressures from the single customer who says without that I can’t use your product. So you add it with the view that it will keep him happy and keep him going which gives you the word-of-mouth to sell the product again. So often we will put in stuff that even we don’t believe should be in it.” (GB, Managing Director, Mature, emphasis added)

This difficulty in judging the timing of when to release a new feature or to adopt a new technology supports the finding in section 5.7.1.2 – that there are still some decisions that require an element of judgment and experience and that this must be considered when assessing which approach is relevant to the context of the decision at hand.

One of the outliers in the entrepreneurial orientation discussion is SC (Team Leader, Stable), the only non-EXCO member in this study. SC’s ability to take risks is limited by the structures and processes within their organisation.

“Nothing I can think of hey. We tended to stick to a process, a rigid process, we did everything by the book, we just made sure that there weren’t any risks involved.” (SC, Team Leader, Stable)

“So sometimes we would take risks and on-board a client, with the promise that they would sign up for an annual license. But we had a process where it’s difficult for us to on-board you unless you have gone through all the contractual arrangements” (SC, Team Leader, Stable)

From the perspective of innovation and proactiveness, it would appear that SC was unable to engage in this as their operational commitments constrained them from doing so.

“It was easy to come up with ideas and stuff, but it’s difficult to implement them if you are working with 4 or 5 different clients. You only have 8-10 hours in a day... I was so busy and everyone focused on those particular clients that they are working on, on a day-to-day basis, you really don’t have time to focus on anything else. And because the teams were so small there was not that much capacity for us to explore other opportunities.” (SC, Team Leader, Stable)

This was despite the fact that SC’s company included KPIs around innovation and was pro-active in their performance management solution.

“Externally ... our KPIs, there were KPIs around innovation and understanding what is happening within the industry, realistically there was not much time.” (SC, Team Leader, Stable)

SC felt that the responsibility to be innovative and proactive lay with their manager.

*“I suppose for our manager, **he is the one that obviously had the time to look at new opportunities** and where we could **differentiate and explore.**” (SC, Team Leader, Stable, **emphasis added**)*

This view from an operational perspective further supports the finding that the role of the leader in determining the entrepreneurial culture in an organisation is pronounced and can be used as a proxy for the rest of the organisation.

Conclusion: EO and big data

What was found during the analysis of the transcripts was that the majority of the MDs in this study displayed elements of each of the three EO elements, which supports the proposition that a leader who encourages an entrepreneurial culture is an important driver in the adoption of big data.

It was also found was that:

- Small businesses that use a web-based business model or who show higher levels of technological resources and understanding may be in a better position to adopt big data than those that do not.
- The use of a formalised approach like the Lean Start-up method by three of the MDs shows the entrepreneurial approach of these individual leaders and their ability to find ways of exploiting opportunities, despite their constrained resources.
- Experimentation allows small business to generate data to help them with their decision-making through either:

- Building a “minimum viable product” as per the Lean Start-up method and then testing their assumptions about the needs of their customers first before investing too many resources into that development; or
- Doing AB testing on their website to understand what is the most effective change to make in their processes or interface.

The use of experimentation allows these small business leaders to manage their risk when they adopt a new technology or invest in the development of new feature. This ability to mitigate their risk while innovating places small business in a good position to be creative in their approach and more able to exploit opportunities that they identify using big data. It also supports the need to understand the use cases in which small business is employing big data and big data analytics, which is the focus of Research Proposition 2.

Finally, there was evidence found that there are still contexts where the experience and judgment of the decision maker must be included in the decision-making process, for example, when deciding when to time the adoption of a new technology or to estimate the reputational value of adding a feature for a single client.

5.7.2 Summary of findings: Research Proposition 1

From the conclusions drawn from the evidence in sections 5.7.1.2, 5.7.1.3 and 5.7.1.4, the following was found in terms of both Research Proposition 1.1 and 1.2:

- The leaders of the organisation had a pronounced impact on the culture of the organisation and the decision-making approach, and the EO of those leaders could serve as a proxy for the rest of the organisation.
- The majority of respondents in this research supported the use of evidence in their decision-making. There is therefore support for Research Proposition 1.1 which states that the decision-making culture of the organisation must support the use of evidence if the organisation is to be successful at using big data.
- The majority of the organisations in this study had leaders who showed high levels of the three elements of EO. Therefore, there is support for the Research Proposition 1.2 that a small business with a leader who displays a high level of EO is more likely to be successful in adopting and using big data analytics. Of the three elements of EO, proactiveness and innovation may be more important than risk-taking, as a number of the respondents used experimentation as a risk management strategy when innovating or adopting new technologies.

It must be noted that there was also evidence found that elements of judgment and experience are still necessary in certain decision-making contexts, even when an individual expresses a preference for evidence in decision-making. For example, in situations involving the emotion and context of the user, when judging the market in terms of the right time to invest in a new innovation and when there is little or no data available to base the decision on.

5.7.3 Research Proposition 2

Small businesses that are successfully using big data use it for one or more of the following purposes:

1. To process large internal data stores to improve operations;
2. To enrich internal data with data sourced outside the organisation; and
3. To scan their environment and their industry.

However, small businesses are unlikely to have large internal data sources and should focus on either enriching internal data or using big data to better understand their environment and help them segment their market.

5.7.3.1 The use of big data among the respondents

There are findings that the leaders interviewed during this research display EO, with respect to innovation, proactiveness and risk-taking, which is expected of small business. Consequently, there is an appetite for data experimentation and evidence-based decision-making. This propensity places respondents in a frame of mind where they are able to view big data as an opportunity, if not always as a source of evidence.

In terms of Research Proposition 2, the form and nature of data use becomes important. Data is certainly used by some for testing, and the nature of this data and its source will be informative on its use in decision-making and operational improvement. Research Proposition 2 seeks to identify how and for what the respondents are using big data analytics. During the analysis of the transcripts, examples of big data use were identified and those uses will be discussed individually below. During the analysis, a use was inductively identified which involved the “blending” or “digesting” of external data on others’ behalf and then providing it either as a data set or doing analytics on that data for those who do not have the ability or skills to do it. This use case has been identified using the nomenclature “-as-a-service”.

5.7.3.2 Big data versus information poor

During one of the interviews, an important point was made by RJ (Chief Technology Officer, Mature) that there are instances where big data analytics are not required to solve what is actually a traditional data warehousing problem. There are cases where organisations already have data stores in their organisation but they do not have the solutions in place to take that data and turn it into information. This creates what they feel is an “information poor” problem, rather than a big data problem. These types of problems can be solved using traditional warehousing solutions that are well understood, rather than trying to source external sources of information using big data analytics. The focus should rather be on getting the right information into the hands of the people that use it to make decisions. This is explained in the following quote:

*“Yes so that is always... there is a little bit of a... maybe not chicken and egg but there is certainly one frame which is saying **we’ve got to know the type of questions we need to answer before we acquire the data** because you take the kind of traditional decision support systems into data warehouses, into BI, the **traditional approach has been I want to understand what of my products are being sold; where were they sold from; what is my margin; who sold them; what customers bought them; when did they buy them.** Those are the questions you are wanting to answer and that is **largely because people have been in an information poor environment. They’ve got the data to answer that question** and then what you do is you **structure that data in a fashion that answers that type of question.** Hence **whatever data warehouse kind of architecture you attach to it will answer something like that.** You still have to have some of that but if you are wanting sales analytics that is actually not a big data problem. That is just an information poor problem. You have got the data there you’ve just **got to get it visualised or you’ve got to get it into the hands of the people who can make the decision.** (RV, Chief Technology Officer, Mature, **emphasis added**)*

To illustrate this point, RV applied it to their own situation and explained that they do not use big data analytics internally as the nature and volume of their internal data is small, but they do help their customers solve big data problems.

*“We don’t have the need to do it ourselves. **We don’t have the need to do that kind of data rich analytics with the type of data we deal with.** We would be kind of grouped into what you call a **professional services firm** so we deal with timesheets, we deal with projects, and things like that... **so the volume and the nature of the data is actually fairly small** so we use normal traditional warehousing kind of mind-sets to do that type of analytics. The **need to blend external data or other sources is actually... it is not going to tell us anything so we don’t use it ourselves, but we engage in big data problems with our customers to help them solve it**” (RV, Chief Technology Officer, Mature, **emphasis added**)*

This finding shows that it is important for a small organisation to consider if they might be better served looking internally at the data they already have and ensure that they are using it to its full potential before looking at investing in big data analytics.

5.7.3.3 Internal data and enriching internal data using external data

All three of the respondents (two Mature, one Start-up), whose business models were primarily web-based, collected the data generated by their online platforms (internal data) and then supplemented it with data sourced externally from readily accessible

online tools like Google Analytics and Effective Measure. This is, however, easier for them to do than the other respondents who do not use the web as their primary sales channel. This is because the “free” big data analytics tools are mostly focused on web analytics and social media reporting. This is evidenced by the following quotes. FM (Managing Director, Mature) expressed the importance of monitoring the performance of their platform using the web analytics.

*“Not really a dashboard we just have **got big admin to the website where we can go and pull anything we like whatever**, however. I don’t have a dashboard. I know commercially the guys want a dashboard but for me I just know where to go to get the info...but it is a... when it is statistics **with Google analytics** or any stats all it is interpreting web logs...**it is something to reference against and it gives you insights to the behaviours around your platform** and all that kind of jazz. **Absolutely, you have to.**” (FM, Managing Director Mature)*

JA (Managing Director, Mature) supplemented data from their internal system using Effective Measure and compared it to their online marketing spend.

*“Mostly internal, a little bit of external, like from Effective Measure or whoever the system was that we used for the web reporting...obviously there are heaps and heaps of data around everything – around every listing, around every web analytics, the search engine marketing that they spend money on – so yes, **there was always lots and lots of data to play with..**” (JA, Managing Director, Mature)*

RV (Managing Director, Start-up) used web analytics extensively to refine their development, through their AB testing.

*“...we measure everything...We **do a whole Google analytics** and we track it bi-weekly and **every time a change comes in you mark it to see what happens**. So we will do quite a **lot of AB testing...**” (RV, Managing Director, Start-up)*

Another respondent, GB (Managing Director, Mature), identified the need to move their sales process to an online channel rather than through the call centre that they had been using. GB optimised the performance of their website through the use of Google Analytics.

*“... **all the Google analytics** as well to see-- **because our marketing drive is to get people to go to the website to look at what the product does and then to hit the contact button** so we, you know, more and more **we want our leads to come through the website.**” (GB, Managing Director, Mature)*

The above quote from GB highlights that it is possible for a mature organisation that was founded before the advent of big data analytics and which has a preference for using evidence in their decision-making to engage with big data analytics over time. It must also be noted that no respondents in this study were found who were using big data analytics solely for processing big internal data. This does not suggest that examples of these small businesses do not exist but is more likely an indication that small businesses are unlikely to have big internal data stores, and therefore are more likely to fall into the other categories.

5.7.3.4 Scanning their environment

Research Proposition 1.2 proposed that organisations need to display an entrepreneurial culture, specifically with respect to proactiveness. It was proposed that proactiveness and the drive to understand the environment was necessary, if one were able to identify and exploit a niche in a market by:

- understanding your industry;
- understanding who your competitors are;
- knowing who your customer is and what his needs are;
- understanding what your customer is saying about you; and
- understanding what technological changes are coming that may affect your business and industry.

It has already been established that the leaders interviewed in this study displayed higher levels of proactiveness and innovation. What the researcher wanted to establish was whether they were using big data analytics to do this. During the interviews, respondents described how they went about scanning their environment, with floating prompts used to ask questions to determine, for example, what their best sources of information were; what tools they were using, if any; whether they knew who their competitors were and how they engaged with social media and the social media analytics tools.

Team Lead / Social Media Listening

It was found that DT (Team Leader, Start-up) and to a lesser extent SC (Team Leader, Start-up) used their big data tools in researching and understanding their competitors' offerings. This is possibly because that they already had access to those big data tools as part of their operational function and did not have to go and specifically source them.

DT (Team Leader, Start-up) looked at their competitors' strengths and weaknesses using the same tools as for their clients to know where the company was in relation to the competitors' capabilities.

“Pretty much the same tools that we use for our clients so good old Google is an amazing source for lots of different things and then... but then again also for the online reputation management we would be looking at web-sites data through another tool that we have which allows us to understand what the strengths and the weaknesses are of competitor websites ...I always get a sense that in a way that we are ahead of a lot of our competitors but there are a lot of other competitors who don't play in the creative advertising agency space who have been doing this kind of stuff for a long time.” (DT, Team Leader, Start-up, emphasis added)

SC (Team Leader, Stable) did not have a set method for researching who their competitors were but when they were working on a proposal for a client, they would ensure that they knew what their competitors were likely to be offering. This was so that they could differentiate themselves and improve their chances of success.

*“There was **not any formalised structure...a lot of it is just desk research**, nothing formalized, **if we wanted to pitch to a client** and we knew that **two or three other digital agencies are pitching for that particular client** we would just basically **do some desk research around those particular vendors** and **what they would potentially be offering differently than what we are not able to offer...we would then sit down** and talk about what exactly can we do, **what can we bring to the table, what research do we need to do to kind of fill the gaps in understanding and provide a better point of view towards the client.**” (SC, Team Leader, Stable, **emphasis added**)*

Mature group

The mature group all had a clear sense of who their competitors were, which is understandable, given their longevity. There was also a distinct sense of ensuring that they understood their client’s needs. In JA’s case (Managing Director, Stable), they knew most of the competitors personally and this meant that they did not need to apply big data analysis to know who they were but could rely on their personal network instead.

*“Yes, there were always lots of competitors...**we definitely spent some time assessing the competitive landscape** but **probably for a long time not as much as we should have** and **then for a short time a little bit more than what we should have** but **yes, it was never a major focus...everybody knew each other personally** and we would see each other at least once or twice a year” (JA, Managing Director, Mature, **emphasis added**)*

JA explained that they relied on user (customer) feedback for improving their system.

*“...we would get **lots of feedback from lots of users all the time**. Mostly when they complained about something...the last few years we were heavily focused on agents so a lot of the work we were doing was getting more agents on the system, **understanding their needs, understanding how they found the system, how we could make the system better for them... we were looking for lots of ways to try to improve that product and getting as much feedback**. But a lot of the feedback was based on sales people going to talk to agents, trying to figure out what their needs are, how they are finding the system, how we could improve the system.” (JA, Managing Director, Mature, **emphasis added**)*

FM (Managing Director, Mature) characteristically had a different approach to looking at what their competitors were doing. FM felt that, while it was important to know where the competitors were relative to where FM was, FM did not want their approach to cloud their thinking.

*“**I watch them to see where they are at**. I am not being arrogant **but I think they watch us for guidance**. I watch to see where they are at as in the catching up thing **but I don’t like to look at them because then they start clouding your thoughts**” (FM, Managing Director, Mature, **emphasis added**)*

FM would rather combine their own experience with feedback from the users and made a point of reading and understanding every piece of feedback that they received. FM would then reflect on how to use that information to improve their platform. As for FM, it was critical to respect customers.

*“**You think about it and look at your own... well I look at my own experiences at other places and you hear dealer feedback. I read every single customer comment that comes into [anonymous] – the good, bad, the ugly, suggestions, complains, and ideas. I religiously read every single one. Maybe not every day but I will read everything and get some insights out of that. I am always pondering, always, always pondering because again I am saying, how do we make this better?**”*

*“**Customers... you have to respect who your customers are...Respect the buyer because the buyer is not a fool.**”*

*(FM, Managing Director, Mature, **emphasis added**)*

As the MD in the mature group that described himself as a numbers guy, GB explained that they also made use of the internet to analyse the information on their international competitors, and that they looked to understand why they did not win certain deals and also at what percentage they did win.

*“...yes we **certainly know who all our competitors** are... there isn't a local competitor, it's all international, on both sides... then what we try to do is we **analyse** from a software point-of-view what **the functionality of the competitive products is which isn't that hard to find out because their marketing websites usually publish what they are.** As I said earlier **one of the challenges though is to find out what their pricing would be,** because for some reasons -- application software -- the prices are not transparent...So on the competitive front, yes, **we also try and look at the market and say of all the deals that we know that have gone down that we didn't win who won them and what percentage are we winning versus the competition.**” (GB, Managing Director, Mature, **emphasis added**)*

Of the MDs in the mature group GB also had the highest level of engagement with social media, which ensured that he was notified of any mention of their company on social media. GB felt that word-of-mouth was a key element to getting new business.

“Well I use the Google keywords so that any time our product or company is mentioned, I get an alert from Google...So word-of-mouth is key, key to the business... If not 25%, then more of your business comes from word of mouth.” (GB, Managing Director, Mature)

GB again highlighted the importance of using customer feedback in the continuing development of their software. GB also emphasised that ensuring good customer service was central to their company culture.

“Well, feedback from existing clients would drive the functionality of the software so a lot of the product development is around what our existing clients are saying they need...And we are very, very, jumpy on the customer's complaints, getting those sorted out as quickly as possible.” (GB, Managing Director, Mature)

RJ (Chief Technology Officer, Mature) stated that it was important that they understood who their competitors were and that they had to “look forward” all the time, which is again evidence of their proactive culture. Their sources of information were leveraging their technology partners and “general-internet scanning”, a source of information that is used by most of the respondents.

*“We do competitor analysis. The competitors to our type of business are other systems integrators so we do look at that. We do look at new entrants into the market on that side...our partners like Microsoft and their competitive analysis because they’ve got lots of ability to do that. We do look at things like Gartner are well...general-internet scanning...look because we are in that systems integration space we’ve got to look forward all the time otherwise we can land up in obscurity.” (RJ, Chief Technology Officer, Mature, **emphasis added**)*

From the evidence detailed above and the findings regarding the mature group, it can be seen that mature organisations are more likely to make use of metrics and evidence as part of their decision-making. They look for sources of information both internally and externally and are concerned with understanding their customer’s needs, both through experimentation and listening to customer feedback. They have highlighted the necessity of balancing the use of data with the application of judgment and experience to the different decision contexts and they look for data externally where they are able to source it. All of this suggests that mature organisations may already be well positioned to adopt big data analytics.

Industry focus

Two of the three stable respondents, BL (Managing Director, Stable) and AT (Sales and Marketing, Stable), were strictly industry-focused – in this case on the insurance industry. BL stated that their decision to focus on the insurance industry came after a year of market research, with a focus on what their customer needs were.

*“So you see among the three sort of generic strategies, one being cost advantage, the other being differentiation, we chose one of focus. So we chose to focus only in the insurance sector and to apply that discipline to achieve our primary purpose. And the primary purpose of [anonymous] is to create value for its insurance customers and we do that through the application of geographic information systems and data...so we spent about a year before we built anything we spent a year doing market research, we followed quite a well refined research and... there were six or seven go-no-go gates and if at any point we decided not to go then we would have canned the project. But it was quite a rigorous approach that we took; it was a year of market research.” (BL, Managing Director, Stable, **emphasis added**)*

Their sources of information were from talking to other people at trade shows, magazines and the internet, but mainly from their customers.

“The main sources of information are actually very similar to what you and I are doing now, its conversation. It’s conversation with customers and it is a fair amount of research into the GIS discipline, so that would be through websites, through industry magazines, through

*trade shows, but a lot of our strategy is formed by our customers.” (BL, Managing Director, Stable, **emphasis added**)*

AT echoed a similar sentiment regarding the importance of the needs of the customer and their sources of information were similar to BL’s, namely their customers and trade shows (conferences).

*“Look, we’ve got **various requests from various insurance companies on what they want to do with their data** so we basically **comply to the requirements of the insurance company** that we deal with to host, manage, and store including dissecting of their data... We are also looking at current trends and what is happening and **taking the lead from the insurance companies what their need is and we build on what we perceive the current need is in the industry. We keep our eye on our competitors** but I have to mention that our competitors don’t compete directly in the holistic field that we do. They compete in various elements, like we have procurement systems that we compete with and then we have settlement systems that we compete with **but there is nobody that really offers the all in one type solution that we do, but we do keep abreast of the industry constantly** and know what is happening. We **don’t do surveys and that type of thing**. We sort of **pick up from editorial and conferences**. We just came back from this insurance conference in Sun City. **We have a look at the trends and that type of thing that is happening** there and we sort of apply it.” (AT, Sales and Marketing Director, Stable, **emphasis added**)*

In both cases their clients were business, not individuals – which meant that social media was not relevant to them.

*“We are **not prolific users of social media**, we are very much a **business to business niche** focused business. So **as I have mentioned already a lot of that data comes from engagement with our clients**.” (BL, Managing Director, Stable, **emphasis added**)*

*“Yes. We have a Facebook account. We haven’t gone Twitter. We **sort of tried Facebook but we found that Facebook isn’t really the right platform for us and it is also difficult. I have started LinkedIn** which we believe is key, **but because of the product being so specialised and so dedicated it is not really an open... in an open platform really acceptable basically**. We have tried the Facebook. I do post from time to time but **it is not really stirring the market** so we **rather dedicate our resources around sales and marketing than to have the Facebook and Twitter**.” (AT, Sales and Marketing Director, Stable, **emphasis added**)*

The similar approach of these two stable organisations in the same industry suggest, mirroring the finding from the mature group, that using customer feedback is an essential part of ensuring that your business remains relevant to your market and your industry.

Based on the evidence presented, it can be said that while most of the respondents were actively scanning the environment for information and using that information as part of their decision-making – an important aspect of entrepreneurial orientation – it is not always feasible for them to use big data analytics to do so. This may either be because of their industry or their business model. Leaders still rely on personal networks, speaking to others, general internet scanning and technology partners as their most useful sources of information when scanning their environment.

5.7.3.5 External data: Blending and digesting

“The big data problem or excitement is when you start taking that data and you blend it with other data.” (RJ, Chief Technology Officer, Mature)

A use case for big data analytics that was identified inductively was that of providing “data-as-a-service” or “analytics-as-a-service”. What this means is that respondents were not necessarily applying big data analytics to their internal data but were either sourcing large external data sets and then “blending” them with client data to provide “rich analytics” or using online tools to “digest” big data on their client’s behalf. For example, taking social media data, interpreting the sentiment and then providing reports back to clients who were not able to do that themselves. These clients included large car manufacturers and some of the large South African banking institutions. This allowed those clients to provide a needed service to their own clients. In most cases, these small businesses were able to provide people with a specialist skill set that these large institutions themselves had not developed, highlighting again the importance of skilled people to these small businesses and why culture and fit are so important to their success in the market.

What is interesting is that all the members of the stable (4–7 years) and the start-up (<2 years) groups were using this as part of their business models, while only one of the mature group members came close to this use. RJ’s organisation (Chief Technology Officer, Mature) provided consulting to other companies to help them solve their big data problems and, as such, provided a form of “analytics-as-a-service”. Please see the quotation in section 5.7.3.2 for evidence of this. This may be due to a number of reasons:

- Two of the four members of the mature group have easy access to internal sources of data as they have a web-based business model. Data use is more likely an enabler for their business but not necessarily at the core of their business model.
- The mature organisations were all founded before big data tools and technologies were invented and they have had to adopt them post the establishment of their primary business model to support their preference for making decisions based on evidence.

The ability of the stable and start-up groups to commercialise big data as part of their business model, despite their lack of internal data sources, shows that small business should not feel constrained by a lack of internal information. In light of this, whether a business is using big data analytics for internal decision-making becomes less important.

Evidence for the findings above are provided through the following quotes from the respondents. BL (Managing Director, Stable) sourced large external data sets from specialist companies and then combined those data sets with the insurer's data to improve the insurer's ability to understand and rate their insurance risks. This was done by providing them with soil, lighting and fire data that the insurers did not have themselves, thereby providing both data- and analytics-as-a-service.

"...we achieved that by providing relevant, useful, and valid information that gives the insurance company a more informed understanding on the risks associated to the location, which in turn informs policy conditions, exclusions, requirements and premium." (BL, Managing Director, Stable)

SC (Team Lead, Stable) and DT (Team Lead, Start-up) took the data provided by online big data tools, digested it and then presented it to their clients in a format that they could understand and use to make marketing decisions, a form of analytics-as-a-service.

"We would use the software to break down all of these, maybe on a monthly basis you have got 20 000 mentions, we would then break down that conversation based on whatever topics of interest are relevant to you guys, so that you can use that data in a more meaningful way as oppose to just giving you a whole bunch of information in Excel, and you really don't know what that means." (SC, Team Lead, Stable)

"So Google analytics I guess is quite obvious, especially when there is nothing in place on the client side then from a social point of view it would be anything from Facebook to Twitter to... those kind of specific analytics tools, as well as online reputation management, but there depends again on what they use. We are using crimson hexagon as one our tools and that is what we will use if they don't have a provider. If they have a provider, we would work with that. So whether it is Radian 6 or Netbase, there are so many tools." (DT, Team Lead, Start-up)

RV (Managing Director, Start-up) applied the intellectual property that they had built within their online feedback engine to process other companies' data sets and provide analytics to those companies.

"...work with [South African commercial bank] is we integrate our IP or software and analytics into their current systems or modules or feedback methods and then get the data live for them on a dashboard or per trigger, like they get an email or SMS saying, we've picked up something go and have a look. That is why it is custom and it is mostly for bigger organisations with quite a lot of data..." (RV, Managing Director, Start-up)

AT (Sales and Marketing Director, Stable) described how they provided data- and analytics-as-a-service to the insurance industry.

"...the ability to store huge amount of data and to be able to filter through that data to provide smart analytics to the insurance trade whether it be geographic data or plain simple product and settlement data ...the ability to harbour and to dissect and to spit out various types of reports based on the data that we have collated..." (AT, Sales and Marketing Director, Stable)

Conclusion: Research Proposition 2

Of the three uses for big data analytics proposed in Research Proposition 2, evidence was found that:

- Small business should consider if their needs are more around so called “information-poor” problems than “big data” problems before looking for to adopt big data analytics.
- No respondents in this research used big data solely for processing internally sourced data, thereby supporting the proposition that small business is unlikely to have “big” internal stores of data. However, given the success the stable and start-up organisations have had with the “-as-a-service” business model, this may be less important.
- Enriching internal data using external data sources was predominately found among the respondents that were based on the web and who were able to use the free analytics tools provided by Google. GB, who was not web-based at the time, was leveraging web analytics to understand how to drive traffic to a new distribution channel, which suggests that technologically aware mature small businesses should be able to engage with big data analytics.
- While nearly all the respondents displayed evidence of scanning their environment for information on their competitors and their customers, only the two respondents in the social media listening space were using big data tools to actively do this. This was mostly likely due to the fact that they already had access to those tools because they were the same as what they had been using for their clients. Most respondents still relied on the more traditional sources of information, such as networking and the internet.
- The importance of listening to customers and understanding their needs when developing solutions was demonstrated by all the members of the mature group. The Team Leads provided evidence that the technology exists to listen to customers online. This suggests that if a small business is in an industry where they have access to ready sources of information regarding their customers (like social media), that they should endeavour to do so.
- Those small business that showed a distinct industry focus were more reliant on their clients’ feedback and were more successful at using big data analytics to provide data- and analytics-as-a-service, while relying on the more traditional sources of information for scanning their environment.
- All the members of the stable and start-up groups are providing data- and

analytics-as-a-service as part of their core business model. This suggests that start-ups that are looking to use big data analytics should look to these members for examples of how to leverage the technology as a differentiator.

5.7.4 Research Proposition 3

Resource constraints have been seen as a limiting factor preventing small businesses from adopting big data. However, technological advances and internet-based tools mean that the barriers to entry to using big data are lowering all the time. Therefore, of the so-called three Vs of big data, variety should present more of an obstacle to small businesses than either volume or velocity, in their context of operating under resource constraints.

5.7.4.1 Big data and resource constraints

Resources and the use of specialist resources is often described along with the use of big data. The need exists for processing power to handle the velocity, the storage space to handle the volume and the skill to be able to handle the complexity of the variety in both structured and unstructured data. Among the respondents of this study, evidence was sought for the effect of constrained resources and how they were dealing with this issue.

What became clear early on was that the number of small businesses using big data is still low, as the researcher had a level of difficulty in finding small businesses that were using big data analytics. The evidence from section 5.7.3.5, however, shows that while internal use may be low, the opportunity to generate revenue by employing big data tools on other business behalf may be more relevant. In addition, what constitutes big data to a business is dependent on what resources they have and their abilities to process the data they are able to source. This is echoed by RJ (Chief Technology Officer, Mature) in saying:

“So maybe what I should do, because everyone has their own terms, or view of what big data is, some of the views (pause) and the views I’ve come across and they all have validity is, one is big data is just lots of data, terabytes and terabytes. For some companies 100 megabytes is big data for them.” (RJ, Chief Technical Officer, Mature)

When asked if RJ could refer the researcher to other small business using big data, they felt they were very few.

“I think you will find a very sparse kind of population to do that. Most people are still in the exploratory phase.” (RJ, Chief Technical Officer, Mature)

RJ was able to give a very good example of a small business start-up that was successful in using big data analytics and that was leveraging a cloud solution to provide their computing and storage requirements. RJ related how a small team of people was able to process very large amounts of data and who were able to identify fraudulent transactions within these large data sets. Unfortunately, the researcher was not able to secure an interview with this start-up and had to rely on RJ's account of how they were successful in overcoming the resource constraints typical to small business.

*“Also what is interesting there is there are **some small businesses** that are **being** a little bit **innovative saying how do we use this new stuff to do data analytics**...we were dealing with a person in a company that was (pause) it is **one of these data scientist profiles** (pause) the newbies, **new kids on the block**, they were **doing loyalty programme data analysis for a set of companies** that set up, let's say coffee shops in the forecourts of garages. And for (pause) they were **analysing real time the loyalty data coming through from loyalty cards**. Small company. I think the company was **about three or four people doing this leveraging off of the Cloudera type platform**, so **spinning up their own environment**. Pulling in the data dealing with **fairly large volumes, hundreds of millions of transactions**...there was a time where hundreds of millions was a lot...They don't even blink...**Not having to architect much because your processing grunt is there** and then putting some kind of data analytics on the top and **not necessarily following some of the good old approaches that you would use traditionally**...they are not kind of burdened with the legacy of having to do that to get something quantifiable out at the end...**They were able to pull out some fairly interesting insights around fraud transactions**....the way people were using their loyalty system and it was largely internal to actually rack up additional cups of coffee. So they were able to pick that up...” (RJ, Chief Technical Officer, Mature)*

The researcher looked through the transcripts to see if there were any examples of cloud services use, and found that two of the stable group members were using cloud technology as part of their solution. AT (Sales and Marketing Director, Stable) reported:

“We use basic cloud based servers to store and harbour the information but the [anonymous] technology switches the data.” (AT Sales and Marketing Director, Stable)

BL (Managing Director, Stable) related that they had a copy of their software running at their offices, but that their “production” server was hosted and they were using Amazon's EC service form computing capability.

*“...so we would have a copy on a server at our office but **our production server is hosted at Hetzner**. We are hosting at Hetzner and we are hosting with Amazon...I mean **we are using the Amazon EC, Elastic Cloud Services...and obviously the secure storage of data as well**.” (BL, Managing Director, Stable, emphasis added)*

From the results of Research Proposition 2, it is evident that the majority of the web-based businesses were using the “free” web analytics tools, such as Google Analytics, and in the case of the two social listening companies, licensed products. However, they built the cost of the licence into the fee that they charge their clients, which removes the financial burden of carrying that cost themselves. Similarly, by not having to maintain large internal data stores they do not have to carry the fixed cost of the storage required, a boon in a context of constrained resources.

This supports the proposition that the availability of technological solutions, such as cloud services from providers like Cloudera and Amazon and the online analytics tools, both free and licensed, have reduced the barriers to entry for small businesses looking to use big data analytics. This finding comes with the caveat that the small business is in an industry or has the business models that lend themselves to the use of these online tools.

What is evident from this research is that the biggest constraint that these small businesses face is people. Finding people that fit their organisational culture, as is evidenced by the discussions of Research Proposition 1 above, at a cost that they can afford and then retaining them and keeping their skills current remains a challenge. The challenges of finding and retaining staff are evidenced by the following quote from JA (Managing Director, Mature):

*“...then as long as I can remember IT resources has always been a challenge, **to find the right people at the right sort of salary bracket and the right sort of experience to try and keep them and develop them.** So those things are always constraints because **you can never find people as quickly as you want to. It is always a struggle to keep people...**” (JA, Managing Director, Mature, **emphasis added**)*

In the same way that judging the timing around adopting a technology and/or adding a new feature to your solution, RJ (Chief Technology Officer, Mature) expressed a similar issue with when to train and skill up resources in a particular technology. The context of this is that RJ characterised their organisation as being in the professional services industry and they have approximately 140 staff.

*“Resources are a constraint at the moment because **you are dealing with largely new technology frameworks.** That is where you’ve got **your primary resource constraint...largely people.** I mean **from a technology perspective the (pause) because most of the services are in the cloud that is not so much of a resource constraint.** There is **always the other resource constraint which is the training and skilling up of people at the right time and the investment that we make financially into those areas that is a constraint because you can skill-up too early, you can skill-up too late so how do you judge the right time? That takes quite a lot of focused effort to do that.**” (RJ, Chief Technology, **emphasis added**)*

The approach of one of the Managing Directors in the mature group, FM, is to completely outsource the development of their platform to a specialist software developer, after they had abandoned having an in-house skill set. This shifts the responsibility of managing and training of those resources to an external specialist provider.

*“So **the actual development I outsource. Been down the road of having in-house. Bad mistake** because it is **such a rapid moving industry that you’ve got to be on top of your game.** You **outsource it to professionals who are forced to be on top of their game** because they are pitching for business, **whereas if it is in-house it becomes stagnant,** there*

*is no urgency to figure out what the latest technologies are, what the latest capabilities are as new browsers come out, new programmes, new enhancements and all that kind of jazz.” (FM, Managing Director, **emphasis added**)*

For the start-up web-based business, their approach is to use mainly specialist contractors in an effort to control costs.

*“Resources is always a factor because it is mainly our expenses is resources, **because it is software developers that is actually our business** and it is not like machines where you buy it and it is there, **it is every hour you pay for. So yes resources is definitely one of the most (pause) well every decision gets compared to that.**” (RV, Managing Director, Start-up)*

Conclusion: Research Proposition 3

While resource constraints remain a factor in adopting big data, the use of a combination of online tools and cloud services reduces the complexity and resource requirements of maintaining a technological infrastructure that a small business may not otherwise be able to handle. The respondents in this research demonstrate a high level of resourcefulness by not only using cloud services and the online analytics tools but also by employing a number of other strategies to make use of big data analytics, including employing the “-as-a-service” business model, or getting their clients to pay the licence fees for the more capable products. This supports the contention in Research Proposition 3 that cloud services have made volume and velocity less of an issue for small business.

What is still a major concern for these small businesses is finding and retaining the right people, at the right cost and with the right skill set to deal with the variety in big data. With specialist staff comes the difficulty of knowing when to invest in training those staff in new technology. Some of the respondents managed this by either outsourcing the specialist skill or by employing contractors, thereby creating a variable rather than a fixed cost – a wise approach to dealing with constrained resources.

5.7.5 The data scientist

Much has been written about the type of person who is able to handle the variety in big data analytics. From the importance of having the right human resource demonstrated in section 5.7.4.1 above and in the interest of rich description, the following quotations have been included in this section to elaborate on some of the perspectives of the more advanced users of big data in this research on the so-called data scientist.

DT (Team Leader, Start-up) describes the type of people whom they have been able to employ in the eleven months since starting their big data analytics team. They describe the type of person that works there, the fact that there is currently no formal education programme available that can teach the required skill set, and therefore also the range of backgrounds that the various team members have.

*“Well, I do think they are a **little bit different** from your average agency or a **creative agency kind of person**, so they would be a **little bit more left-brained** or is it the right side? Anyway **the side that works with the numbers...and I do find that some of the people that we have are all very young and highly motivated, very clever...so far because we have built this up from out of nowhere, from nothing, it means we were looking for people with a certain skill, but it’s not like you can study this somewhere**, so we have someone with a **mathematical background**, someone with more of a **economics background**, someone with a **marketing background** but **all people who can work with numbers**, that can also turn those numbers into something insightful. So it’s not just about being able to work with numbers, **there is a person who is not actually that great with numbers, but she is great in the social, in the online listening space.**” (DT, Team Leader, Start-up, **emphasis added**)*

The focus of SC (Team Lead, Stable), who was an analyst for three years before being appointed team leader, is a little different in that they place a greater emphasis on their resources, having an active participation in social media, while still having good analytics skills and the ability to handle unstructured data.

*“It had to be **someone who really knows and enjoys talking to people, love the social media space and Tweeting and Facebooking**, but also has some **strong analytical skills and loves digging into data and you know taking a lot of unstructured information and that is the nature of it, there is a lot of unstructured data and finding ways to bring it to life and add value to it in a way that client could really understand it.**” (SC, Team Leader, Stable, **emphasis added**)*

RJ’s (Chief Technology Officer, Mature) organisation, being in the specialist recruitment field as well as the professional services industry, provided the following insights on what a data scientist is. RJ noted that data scientists are starting to appear in the market, although in very low numbers.

*“What is interesting is that you **probably find the next wave of data scientists are between let’s say 22 and 25 years old**. There are pockets of them starting to come through. They’ve got some **advanced statistical or mathematical background** and they’ve been **nurtured in larger organisations that have had the time and the, let’s call it the R&D budget, to be able to grow people into having the right skills...they are scarce. If I have seen three in a year it is a lot.**” (RJ, Chief Technology Officer, Mature, **emphasis added**)*

The lack of formally educated data scientists in the labour market means that the respondents in this sample have to be creative with the backgrounds of the individuals whom they employ or whom they need to source and train.

RJ further elaborated that the difference between the traditional data warehouse analytics mind-set and that applied by the data scientist is the ability to start with the data and look for the questions that the data can answer, rather than the traditional approach of starting with the questions and then looking for the data to answer the question. A subtle but important difference.

*“..the kind of newer mind-set is give me data, I don’t care, just give it to me. I might not use it, I might have a use for it later on **but just give it to me and I will see what I can do with it and draw insights from it and I can process it through because I’ve got the new kind of wave of technologies to work on.** So it is a subtle (pause) it is a mind shift difference. You don’t have to go through all the legacy that you’ve built out in the past. They are saying just give me data I will analyse it. That is where the **analytics piece for me is the biggest driver of big data – it is the ability to analyse and gain insights quickly.**” (RJ, Chief Technology Officer, Mature, **emphasis added**)*

The ability to take big data and find a commercial use for it is a great opportunity for those with the entrepreneurial orientation to understand it, experiment with it and proactively go out and sell it – something that small businesses should excel at doing.

5.7.6 Privacy legislation

An issue that was raised by three of the respondents that was not part of the original scope of the research but which is relevant to big data analytics in general, is the issue of data privacy and the legislation that is being promulgated in South Africa. This is focused on data collection and the protection of personal information. In the online e-commerce space, it is becoming more difficult to collect information on the people using websites.

“...it is getting more and more challenging as privacy is becoming a bigger and bigger issue...” (FM, Managing Director, Stable)

The two respondents who focus on the insurance sector are forced to include the effect of data privacy in their decision-making.

“Obviously with TCF and POPI being the major thing now where we need to comply around that so those are the types of issues or the types of key points that we discuss around our meetings. From an insurance perspective we take directive from the insurance companies on what we need to do with compliance and data security and management and that type of thing.” (AT, Sales and Marketing Director)

“...we have to consider the ethical implications and compliance issues around the data. So it’s utility, validity, ethics and relevance...So we (pause) take POPI for example. There were two approaches that we could have taken – we could have – if we are going to put data to the cloud let’s make sure that there is no personal information and put controls in place to make sure that no personal information gets into the cloud...” (BL, Managing Director, Stable)

Companies that are looking to adopt big data analytics will have to look at their own industry and market segments and ensure they understand what legislation is applicable to them and how that will impact on their data collection activities. Not being able to source and then on-sell data due to legislative restrictions may restrict a small business's ability to exploit a particular market opportunity, or their scope to employ the "as-a-service" business models identified in section 5.7.3.5.

Chapter 6: Discussion of Results

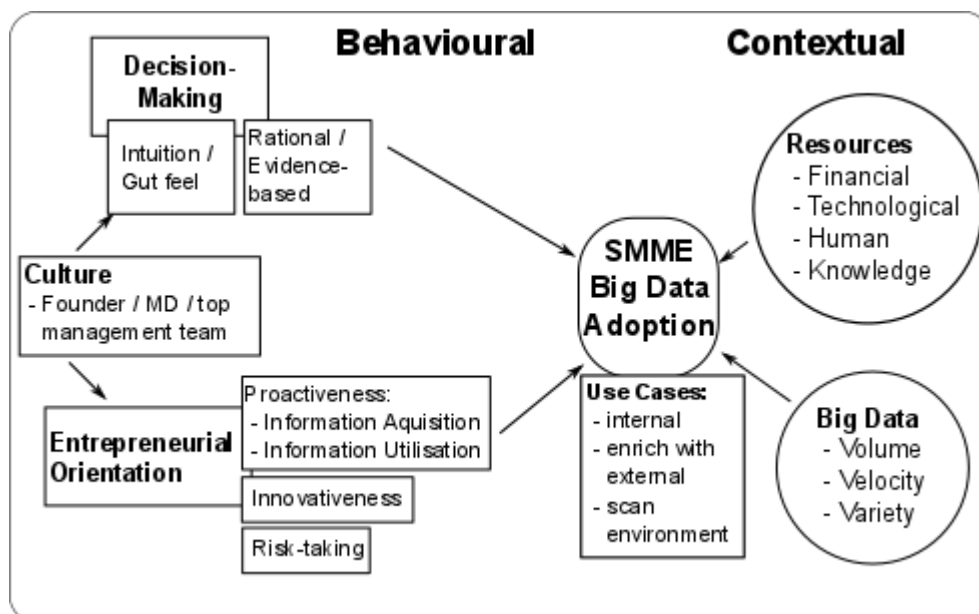
6.1 Introduction

In Chapter 6 the research findings established in Chapter 5 will be related to the literature reviewed in Chapter 2. This chapter links the insights from the findings of the analysis of the nine qualitative, in-depth interviews that were conducted with the managers in small businesses that are already using big data to the literature. The coding and analysis of the interview transcripts has allowed the researcher to establish evidence for or against each of the research propositions that were made in Chapter 3 and these were presented in Chapter 5. First we turn to the original model and its conceptualisation; then, in light of the findings, a summative review of the adapted model is presented. Subsequent to this, each research proposition is then reviewed in turn.

6.2 Application of the conceptual model

The conceptual model developed in Chapter 2 is presented here again for ease of reference in Figure 6.1 below.

Figure 6.1 – Conceptual model presented in Chapter 2



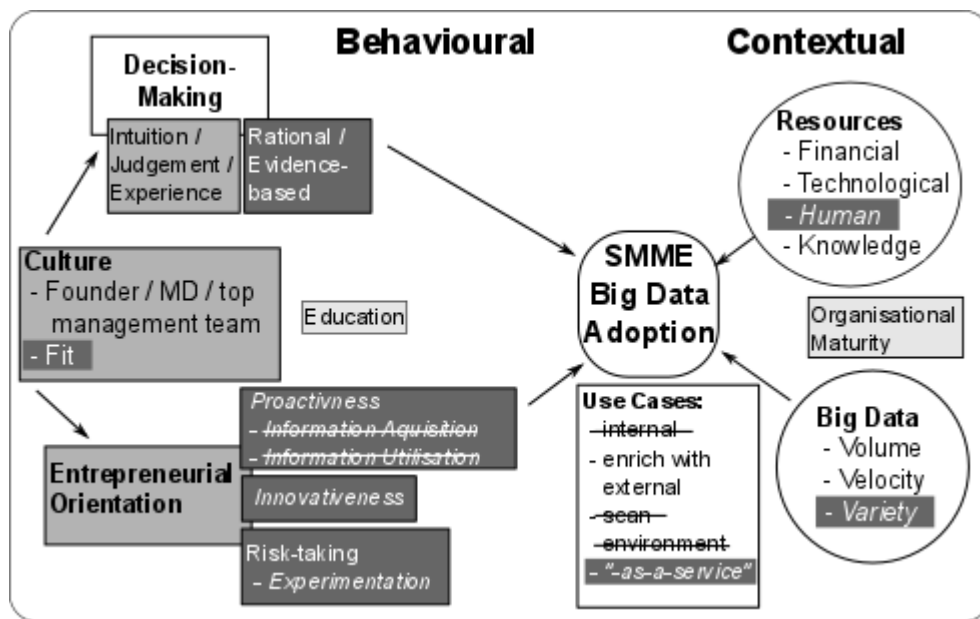
This research sought to understand which factors small business should consider when looking to adopt big data. Given the lack of research into the use of big data in small business, as evidenced in Chapter 1, a number of elements were identified in the literature streams of culture, big data, entrepreneurship and decision-making. These were used to develop the conceptual model shown above. The model was then used to guide the development of the research propositions in Chapter 3 and the interview guide used during the semi-structured, in-depth interviews detailed in Chapter 5.

From Figure 6.1 above, it can be seen that the founder / MD / top management team was proposed as being influential in both the decision-making preference and the entrepreneurial orientation of the organisation, through their ability to affect the organisation's culture, and thereby the behaviour of the individuals within the organisation (Eisenhardt, 2013; Robbins & Judge, 2012; Schein, 1983; Wang et al., 2011). From the literature it was derived that decision-making methods can broadly be split between rational and intuitive decision-making (Robbins & Judge, 2012), with the rational approach being relevant to big data adoption as it relies on the use of evidence (McAfee & Brynjolfsson, 2012; Ross et al., 2013; Rousseau, 2012). It was argued from the available literature that together with a willingness to invest in new technology, a high level of entrepreneurial orientation was necessary for a small business to be actively engaged in looking for information on their environment to use in identifying and exploiting opportunities (Keh et al., 2007; Mintz & Currim, 2013). This is specifically with respect to proactiveness (and a focus on information acquisition and information utilisation), innovativeness and risk-taking. Resource theory suggested that all of this has to occur within the context of the resources available to the small business, who are generally acknowledged as being resource constrained (Stokes & Wilson, 2010; Wiklund & Shepherd, 2011). The more technical aspects of big data, namely the so-called three Vs of volume, velocity and variety detailed in the literature (Jagadish et al., 2014; McAfee & Brynjolfsson, 2012), each presented a different set of challenges for small business. These challenges needed to be considered in the context of the potential use cases that were identified from the literature on how large organisations are employing big data analytics, for example Davenport (2013, 2014) and McAfee and Brynjolfsson (2012).

6.3 Findings as they apply to the conceptual model

The conceptual model has been adapted to include the findings presented in Chapter 5 and is presented in Figure 6.2. The most relevant findings have been highlighted and each of the Research Propositions will be related to the theory in sections 6.4, 6.5 and 6.6 thereafter.

Figure 6.2 – Conceptual model including the findings



It can be seen from Figure 6.2 that the culture of the organisation, as determined by the founder / MD / top management team, was an influencing factor in determining which decision-making approach was used within the small businesses, together with the entrepreneurial orientation (EO) of the organisation itself (section 5.7.1.3). This is broadly aligned with the Research Propositions and follows the logic of the literature. Evidence for the use of rational or evidence-based decision-making was found among the majority of the respondents and, by extension, this supports the use of big data analytics in the organisation (section 5.7.1.2). The type of education of the decision-maker was found to have a possible effect on their decision-making preference, especially among the MDs interviewed in this research (section 5.5.2). While education has been linked to decision-making before, for example by Briner and Walshe (2014) and Charlier, Brown and Rynes (2011), its relevance to the adoption of big data has not, and therefore contributes to the literature. There is the caveat that there are still situations that require the use of some level of intuition or judgment and experience from the decision maker and that these two approaches are not mutually exclusive to each other. In other words, there is place for both. This is especially applicable in cases where the decisions are future-orientated and involve judging the timing of, for example, when to adopt a new technology or when to invest resources in a new opportunity (sections 5.7.1.2 and 5.7.1.4).

A number of the small businesses made use of experimentation as a means of managing the risk of expending resources on exploiting an opportunity (section 5.7.1.4), something

that was not predicted in the literature. People were found to be the most prevalent resource constraint experienced by the respondents (section 5.7.4.1) and this highlights the importance of fit. While the concept of fit is well understood in organisational behaviour, it has not been linked to big data adoption at all. The necessary skills have been narrowly viewed in the light of the data scientist, rather than how such individuals are able to fit with the culture of the organisation at a salary level that the small business can afford (section 5.7.1.3).

The respondents generally demonstrated a high level of proactivity and innovation (section 5.7.1.4) and presented an alternative use case for big data analytics, which has been identified as “-as-a-service” (section 5.7.3.5) and which was not entirely anticipated by the literature. That is to say that small businesses do not necessarily use big data analytics to analyse internal stores of data. Instead, they have created potentially new business models that allow them to deliver pre-digested big data sources. The literature also did not foresee that big data services could be outsourced to small organisations. Surprisingly, small business is able to provide the human resource skills necessary to do the analysis using the big data analytics tools on behalf of clients who do not have the skills to do it but who have the financial ability to pay for that service.

The use of cloud services and a combination of free and paid-for online analytics tools means that volume and velocity present fewer challenges to small business, as was proposed in Chapter 3. But it is still the variety in the form of the data (both structured and unstructured) that requires human resources to process, understand and find ways to extract value from the big data sources (section 5.7.4.1).

The transcript analysis in Chapter 5 found that respondents differed in their levels of organisational maturity, a concept that has also not been linked to big data adoption in the literature. The mature and to a lesser extent stable organisations interviewed were more likely to already use metrics as part of their decision-making due to the maturity in their processes and management forums (section 5.5.4). They were also found to be aware of their environment, although they were using more traditional sources of information as part of their decision-making. This makes information acquisition and utilisation less of a factor (section 5.7.3.4), and is therefore removed from the model along with the suggested use case of environment scanning. Start-up and stable organisations all made use of the “-as-a-service” business model in some way, although

only one of the mature organisations did the same (section 5.7.3.5). No small business was found to have large internal data stores that required big data tools. However, those businesses with web-based business models were enriching their internal data using external data sources (section 5.7.3.3), and for that reason the enrich use case has been left in the model.

The findings of Chapter 5 will now be related to the theory per each research proposition. The individual research propositions from Chapter 3 have been repeated at the start of each section for ease of reference.

6.4 Discussion of Research Proposition 1

There are two main factors that drive the successful use of big data in small businesses:

Research Proposition 1.1

The decision-making culture of the business must support the use of evidence in decision-making, otherwise there will be no support for the use of big data analytics in the business.

Research Proposition 1.2

A small business must have a leader (founder / owner / MD) or management team that displays high levels of entrepreneurial orientation, specifically with regard to the elements of:

1. innovativeness
2. risk-taking
3. proactiveness.

Innovativeness and risk-taking are required if a business with constrained resources is willing to invest in new technologies or skills. Proactiveness is required if a business is actively seeking to understand its environment and looking for opportunities to exploit.

6.4.1 The role of culture

Central to both Research Proposition 1.1 and 1.2 was the role of the culture of the organisation in influencing both the decision-making method used in the organisation and the organisation's entrepreneurial orientation (Lumpkin & Dess, 1996; Ross et al., 2013). Section 5.7.1.3 discussed the importance of culture and the finding that the founder / MD / top management in SMMEs is able to exert a greater level of influence on the culture of the organisation due to the lack of hierarchy and the subsequent closeness of the those leaders to the employees themselves. Culture featured as important to both

the stable and mature respondents, while the two start-ups focused on skills training instead. The majority of the MDs in the stable and mature groups also made use of some form of induction process or training to ensure that new staff members were taught the culture of the organisation, and expressed the importance of finding staff that fit.

These findings are aligned with the literature in the following areas. Schein's (1984) contention is that culture has to be formed within a group that has had time to have a shared experience, learn from that experience and then teach those learnings to new group members (p. 3). This would explain the finding that the mature and stable groups find culture to be more relevant as they have had more time to develop a sense of culture, whereas start-ups are focused on acquiring the necessary resources and building their business. Person-organisation (PO) fit is a well-established concept that can be found in the literature on organisational behaviour. It essentially argues that people are attracted towards and are selected by organisations with whom they share common values and they leave those with whom they do not (Robbins & Judge, 2012, p. 184). However, fit has not been linked to the adoption of big data before. Therefore, the importance given to employees' fit in the organisation by the small business leaders in this research as evidenced in section 5.7.1.3 contributes to the literature. From the model shown in Figure 2.2 in Chapter 2, which explains how cultures form in an organisation, it can be seen that "socialisation" is part of the culture formation process and this process of socialisation includes the use of training and induction methods to ensure that new employees fit in the organisation (Robbins & Judge, 2012, p. 557). The use of an induction process or training was evidenced in section 5.7.1.3 and thus this finding is also aligned with the literature. Figure 2.2 also shows the importance of the role of the founder in establishing and maintaining the culture of the organisation, which is echoed by Schein (1983). This supports the inclusion of culture and fit as a factor in the conceptual model.

6.4.2 Evidence-based decision-making

Research Proposition 1.1 dealt with the contention that a business needs to have a culture of making decisions based on evidence if it were to be successful at adopting big data analytics. This contention was made by both McAfee and Brynjolfsson (2012) and Ross et al. (2013). The work of Rousseau (2012) on evidence-based decision-making (EBDM) suggests that basing decisions on evidence, rather than on intuition, will result in a better quality decision and any available information should be used as part of the decision-making process. The finding in section 5.7.1.2 that the majority of the respondents in this research exhibited a preference for basing decisions on evidence is

in line with the literature's suggestion that a culture of evidence-based decision-making is necessary in a business planning to adopt big data.

Armstrong et al. (2012), after having looked at 40 years of research, found that entrepreneurs have the ability to switch between intuition and using a rational approach as the context demands. The small businesses here mainly expressed a preference for evidence, but Section 5.7.1.2 and 5.7.1.4 also found that there are situations where information is either not available or that an element of judgment or experience may complement the use of evidence. This finding is therefore aligned with Armstrong et al. (2012) and Briner et al. (2009) who list "practitioner expertise and judgment" as one of the four sources of evidence that a decision maker can combine, along with local evidence, the best available research evidence and the perspectives of the stakeholders most affected by a decision (p. 19). This also supports the contention in the conceptual model that while the rational or evidence-based approach applies to big data analytics, there is still room for the use of intuition, based on the judgment and experience of the decision maker, as a source of evidence in decision-making.

FM's (Managing Director, Mature) statement that "...everyone is getting sucked up into this data and yes statistics don't lie. But statistics don't allow for context and emotion" (section 5.7.1.2) highlights one of the current areas of research in big data analytics detailed by Gandomi and Haider (2015), namely "social media analytics" (p. 142). Researchers have identified the need to be able to contextualise and interpret the sentiment behind the comments and images posted by the users of social media. Small businesses are already using the available social media analytics tools (see section 5.7.3.4 for the discussion on the Team Leaders) to do sentiment analysis on the text-based comments made by users of social media platforms. However, much research is required in this area before images and videos can be analysed to the same extent (Gandomi & Haider, 2015). This further supports the finding that there are some situations that will require experience and judgment on the part of the decision maker.

JA's (Managing Director, Mature) statement that they had over time become better at making decisions based on data and that they had learned to discourage decisions based on people's opinions (see section 5.7.1.2) is an illustration of the concept of the "HiPPO" referred to by McAfee and Brynjolfsson (2012, p. 65). HiPPO, or an overemphasis on the Highest Paid Person's Opinion, highlights the need for the senior

decision makers in an organisation to demonstrate to the rest of the organisation their inclusion of evidence in their decision-making, so that it will not hamper the adoption of big data analytics in the rest of the organisation (McAfee & Brynjolfsson, 2012). This further supports the inclusion of the leaders' (founder / MD / top management) impact on the culture of the organisation as a factor affecting the adoption of big data in small business. As JA said, "any decision based on opinions would just result in an endless debate that goes nowhere" (section 5.7.1.2).

6.4.3 Entrepreneurial orientation

Research Proposition 1.2 suggests that the entrepreneurial orientation of the founder / MD / top management will affect the adoption of big data analytics. Entrepreneurial orientation (EO) is the policies and practices that are a base upon which to make entrepreneurial decisions and then take action (Rauch et al., 2009). The three most common elements identified in EO are proactiveness, innovativeness and risk-taking (Lumpkin & Dess, 1996). In section 5.7.1.4, evidence was presented that four of the five MDs interviewed showed higher levels of EO through a combination of the three elements, though more through their proactiveness and innovation than through their approach to risk-taking. The literature presented risk-taking as a doubled-edged sword, as while it is a necessary part of entrepreneurship, it can also lead businesses to fail (Rauch et al., 2009). It is also why entrepreneurial research is often affected by survivor bias (Wiklund & Shepherd, 2011). What was also presented in section 5.7.1.4 was that three of five MDs made use of experimentation as a means of mitigating risk, while they were proactively perusing new opportunities and looking at adopting new technologies within their organisations. Their approach of developing the minimum viable product and testing the acceptance of their innovation with their customers is in line with the practices suggested by the Lean Start-up method advocated by Reis (2011) and goes towards addressing the challenges of risk-taking raised by Rauch et al. (2009). Therefore, the inclusion of proactiveness and innovativeness as factors in the adoption of big data in the conceptual model is supported by the literature. When considering the EO literature reviewed in Chapter 2, no references were found that described the use of experimentation as a means of mitigating the potential downside of the element of risk-taking, which is so often linked with proactiveness and innovativeness in driving firm performance. This would suggest that the use of experimentation in the context of big data adoption is a new finding and it is therefore highlighted in the findings overlaid on the conceptual model shown in Figure 6.2.

6.4.4 Education and its effect on decision-making

There is a movement in the evidence based management (EBMgt) literature that encourages the teaching of evidence-based decision-making (EBDM) as part of MBA programmes. It highlights the importance of education in teaching managers alternative approaches to merely relying on the intuitive approach (Charlier et al., 2011; Rousseau & McCarthy, 2007). It could not be conclusively proved that the education level of the respondents in this study affected how they made decisions, as the prior education of the respondents in the study was not established during the interviews. However, there was evidence presented to support a conclusion that entrepreneurial leaders (especially amongst the MDs) with an education in a discipline that requires logical and rational thinking, such as engineering or an MBA, are more likely to be predisposed to using evidence in their decision-making (section 5.5.2). Therefore, based on the discussion of the influence of the founder / MD / top management on the culture of the organisation in this research, they are more likely to support a culture of making decisions using evidence in their organisations. This suggests that education is an additional element that may influence the decision-making preferences of the individual leaders, which in turn would influence their adoption of big data analytics as part of their organisation's decision-making. This finding contributes to the literature. It is for this reason that education has been included in the findings overlaid on the conceptual model in Figure 6.2.

6.4.5 Conclusion – Research Proposition 1

From the discussions on the findings of Research Proposition 1 in terms of the literature presented thus far in section 6.4, it can be seen that the literature supports the contention made in Research Proposition 1 that:

- the leaders of the organisation were instrumental in determining the decision-making and entrepreneurial orientation of the small businesses interviewed and, as such, are the primary determinants of the success of big data adoption;
- the decision-making culture of the business must support the use of evidence in decision-making if an organisation were to be successful at adopting big data analytics;
- a leader with a high level of entrepreneurial orientation will support the adoption of big data analytics; and
- these leaders were able to demonstrate both proactiveness and innovation in their use of big data analytics, despite their resource constraints, through their use of experimentation as a means of mitigating the risks required to adopt new

technologies and their ability to see big data as an opportunity to exploit, rather than a cost to incur (see section 5.7.1.4 and 5.7.3.1).

6.5 Research Proposition 2

Small businesses that are successfully using big data use it for one or more of the following purposes:

1. to process large internal data stores to improve operations;
2. to enrich internal data with data sourced outside the organisation; and
3. to scan their environment and their industry.

However, small businesses are unlikely to have large internal data sources and should focus on either enriching internal data or using big data to better understand their environment and help them segment their market.

6.5.1 The case for little data

As shown in section 5.7.3.2, RJ (Chief Technology Officer, Mature) made the point that “...if you are wanting sales analytics that is actually not a big data problem. That is just an information poor problem. You have got the data there, you’ve just got to get it visualised or you’ve got to get it into the hands of the people who can make the decision.” What RJ characterised as an information poor problem has been termed “little” data by Ross et al. (2013, p. 92). Ross et al. (2013), who also strongly advocate the need for a culture of evidence-based decision-making, contend that an organisation should look at the use they are making of their own internal data sets before considering the expense required to adopt big data analytics. Ross et al. (2013) further contend that encouraging the frequent use of lots of good little data by decision makers empowers the decision makers to make better decisions on a daily basis (p. 92). Eisenhardt (2013) found that the most effective top management teams in entrepreneurial businesses were those that used more data, more often, who preferred operational measures over accounting-based ones and who reviewed this information on a regular weekly basis with all their staff (p. 810). The literature therefore supports the contention made in section 5.7.3.2 that small organisations should look internally at the data that they are already using and ensure that they get that information to the right people more often to help them make more effective decisions, before they look at investing in big data analytics.

6.5.2 Use cases for big data

Three main use cases for big data analytics in large organisations were identified from the literature on big data, namely using big data tools to process and analyse extremely large internal data stores, enriching internal data with external data sources and

scanning the external business environment (Davenport, 2013; Lau et al., 2012; McAfee & Brynjolfsson, 2012). From these use cases in large organisations, it was posited in Research Proposition 2 that small business would potentially be using big data in the same way. However, this came with the proviso that small business is unlikely to have large stores of internally generated data, and therefore their use would be more focused on enriching internal data sources with external data and scanning their external environment for opportunities to exploit.

As evidenced in section 5.7.3.3, none of the small businesses interviewed were using big data tools to process extremely large internal data stores, supporting the proviso made in Research Proposition 2. This does not suggest that examples do not exist, only that none were found by the researcher. This may work to the advantage of small business for two reasons. First, they do not have to incur the fixed cost of maintaining large stores of internal data that they may not be using, which is extremely advantageous in a context of constrained resources. Second, recent research suggested that companies who have high levels of success extracting value from their internal data sources may actually delay their intention to use big data to look for sources of environmental information (Kwon, Lee, & Shin, 2014, p. 391). As small businesses are less likely to have large internal data stores, this finding may provide them with an advantage over large organisations that have to incur higher levels of fixed cost and who may in fact be less likely to use big data to gather environmental data.

The use of big data for environment scanning was linked in Chapter 2 to the EO of small business through the information acquisition and information utilisation, based on the work of Keh et al. (2007) and Mintz and Currim (2013). While section 5.7.3.4 found that there was some evidence of the use of sentiment analysis, especially among the Team Leaders, most of the respondents relied on more traditional sources of information, such as personal networks, online publications and the internet in general for gathering information on their environment.

It is for this reason that information acquisition and information utilisation was removed from the new conceptual model which includes the findings of this research presented in Figure 6.2 above. This has been replaced by the element of experimentation discussed in section 6.4.3. In addition, the lack of use of big data tools by the majority to do environment scanning may indicate that the technology needs time to evolve. While it

may still emerge as a potential use for small business, insufficient evidence was found to support the inclusion of environmental scanning in the model presented in Figure 6.2.

Evidence was presented in section 5.7.3.3 that those small businesses that have a web-based model are more likely to use external data to enrich the internal data generated by their web platforms by using the free analytics tools provided by companies like Google. This suggests that the use case of enriching internal data by means of external data sources is valid in the small business context and, as such, it has been included in the model presented in Figure 6.2 above. As this use case was proposed based on the literature reviewed in Chapter 2, it is aligned with literature in this case.

The use case that was inductively identified during the analysis of the transcripts and which has been termed “-as-a-service” in section 5.7.3.5 now needs to be considered in terms of the literature. Data-as-a-service is the loading of data into the cloud, which removes the concern of where the data physically sits as this is managed by the cloud services provider (Delen & Demirkan, 2013). Analytics-as-a-service is the running of analytics on data, locally or in the cloud, without regard for where or what the computing resources are (Delen & Demirkan, 2013). The moniker of “-as-a-service” is often appended to terms to suggest that they are now hosted as part of a cloud solution, for example: computing-, platform-, and software-as-a-service (Delen & Demirkan, 2013). In the context of this research, the term “-as-a-service” was used to describe the approaches used by the small business owners who are leveraging cloud computing and storage resources, while adding their unique skills and human resources to enrich the offerings of the cloud service providers. Evidence was provided in section 5.7.3.5 that all the members of the stable and start-up groups, and arguably one member of the mature group, were doing this in two ways. First, big data analytics was not necessarily being applied to solve internal data and analytics problems. Rather, these small businesses were developing the skills and expertise internally to use big data tools to do the analytics on their client’s behalf. It is suggested that this approach may be loosely termed as “professional-analytics-as-a-service”. Second, there were also examples of where small businesses were making use of cloud service technology to gather external big data sources, digest them on their client’s behalf and then provide them with analytics that those clients could use to improve their own decision-making. It is suggested that this be termed as “digest-data-as-a-service”.

No published literature regarding the use of big data analytics in this manner by small business has been found in the peer-reviewed academic literature, which suggests that this is a new finding. It is for this reason that the use case of “-as-a-service” was added to the model presented in Figure 6.2 above.

6.5.3 Conclusion – Research Proposition 2

Support was found for one of the three proposed use cases of big data in small business, namely enriching internal data using external data sources. The contention made in Research Proposition 2 that small businesses are unlikely to have large internal sources of data was found to be true in the case of the small businesses interviewed in this research, although this may work in their favour in two ways. First, they do not have to incur the fixed cost of maintaining large internal data stores. Second, they may have an advantage over large organisations who may actually be less likely to source environmental data using big data tools as they are satisfied with their own internal data.

A new use case was identified during this research, which has been termed “professional-analytics-as-a-service” and “digest-data-as-a-service”, or “-as-a-service” for short, and it is suggested that this has not been documented in the literature before.

6.6 Research Proposition 3

Resource constraints have been seen as a limiting factor which prevents small businesses from adopting big data. However, technological advances and internet-based tools mean that the barriers to entry to using big data are lowering all the time. Therefore, of the so-called three Vs of big data, variety should present more of an obstacle to small businesses than either volume or velocity, in their context of operating under resource constraints.

6.6.1 Big data and resource constraints

Small businesses are generally acknowledged as being resourced constrained. One of the challenges facing the small business manager is making decisions across a broad range of functional areas, often without the specialist knowledge required, while balancing the needs of organisation against its scarce resources (Nieman, 2006; Stokes & Wilson, 2010). In order to remain competitive, organisations need to combine both their tangible, namely their financial and technological capital, and their intangible resource, namely human and knowledge resource, in novel and innovative ways which cannot easily be copied by their competitors (Barney, 1991). There is a view that being entrepreneurial means that an opportunity must be pursued despite the lack of resources

and that the ability of an entrepreneur to leverage external resources is one of their hallmarks (Stevenson & Jarillo, 1990; Stokes & Wilson, 2010). In section 5.7.1.4 the following quote from BL (Managing Director, Stable) was used as part of the evidence of the level of entrepreneurship demonstrated by the MDs in this research: "...if we get presented with an opportunity, we say yes and then we go figure out how to do it." This quote is evidence of the view suggested by the literature that entrepreneurs will look to exploit an opportunity despite their constrained resources, and by making use of the free analytical tools they are in fact also leveraging external resources to do so.

Evidence was presented in section 5.7.4.1 of this approach as it was found that the majority of the web-based businesses were using the free web analytics tools, such as Google Analytics. The two Team Leads that were working in social listening companies were using licensed products. However, the cost of the licence was built into the fee that they charge their clients, which removes the financial burden of carrying that cost themselves. Similarly, by not having to maintain large internal data stores, they do not have to carry the fixed cost of the storage required, which is a boon in a context of constrained resources. This supports the proposition made that the availability of technological solutions, such as cloud services and online analytics tools, has reduced the barriers to entry for small businesses looking to use big data analytics. This finding comes with the caveat that the small business needs to be in an industry or have a business model that lends itself to the use of these online tools. In addition, while a number of uses for cloud services have been documented, such as those by Delen and Demirkan (2013), no literature was found that links the use of cloud services as a means of reducing the barriers to entry for small business in adopting big data analytics, which suggests that this is also a new finding that contributes to the literature.

Of the tangible and intangible resources suggested by Barney (1991), it was found in section 5.7.4.1 that people were the biggest constraint faced by the small businesses that were interviewed during this research. As suggested by Davenport and Patil (2012), the data scientists with the necessary skills to understand, explore and exploit the commercial opportunities found in big data sources are very rare. The descriptions given by the respondents in section 5.7.5 of these data scientists and the alternative approaches they have had to take to find the right resources also correspond to those given by Davenport and Patil (2012). It is argued though that the view of the data scientist has been too narrowly focused on the required skills. The findings in section 5.7.5 and

5.7.4.1 regarding the need for resources that also fit with the culture therefore extend the literature on culture as it applies to the adoption of big data in organisations.

6.6.2 Conclusion – Research Proposition 3

From the discussions regarding the findings of Research Proposition 3 in terms of the literature presented thus far in section 6.6.1, it can be seen that small businesses that have successfully adopted big data analytics are using cloud services and internet-based tools. This allows these small businesses to manage the complexity of volume and velocity, despite their constrained resources.

The contention made in Research Proposition 3 that the issues of volume and variety should be less of an issue to small business is also supported, as finding the necessary human resource required to manage the variety in the forms of big data was identified as their biggest constraint. It is for this reason that human resources have been highlighted as the most important resource constraint in the model shown in Figure 6.2 above.

6.7 Organisational maturity

The final element of the model of the findings in Figure 6.2 that has to be examined in terms of the literature is that of organisational maturity. During the transcript analysis in Chapter 5, it was found that respondents differed in their levels of maturity, as identified in section 5.5.4. For example, it was found that the mature organisations held regular management forums and the majority of them looked at some form of metrics during those meetings, which suggests that they are more likely to use evidence as part of their decision-making. This would position them well to be able to adopt big data analytics as per Research Proposition 1.

A Capability Maturity Model (CMM) was proposed by Paulk, Curtis, Chrissis and Weber (1993) to provide a framework that could be used by software companies to improve their software development process. No such model could be found that can be applied to big data implementation. However, the existence of a framework that measures the maturity of an organisation in relation to software supports the inclusion of the maturity of the organisation as a factor to consider in the adoption of big data analytics in small businesses, and therefore contributes to the literature.

Chapter 7: Conclusion and Recommendations

7.1 Introduction

In this chapter, the findings of Chapter 5 and the discussions in relation to the theory in Chapter 6 are consolidated into a framework that intends to summarise the outcomes of this research. A discussion of the implications of the framework for management, limitations of this research and suggestions for possible avenues of future research will follow thereafter.

7.2 Principle findings

7.2.1 Summary of the finding of this research

The main objective of this research was to try and identify what factors small businesses should consider when looking to adopt big data analytics. Small business, with their typically entrepreneurial leaders, have a reputation for being more agile and better at exploiting niche markets than their larger counterparts. Despite their constrained resources (Nieman, 2006; Stokes & Wilson, 2010), they would seem ideally suited to take advantage of the opportunities that big data analytics could help them identify. However, there is also the general assumption that small business managers would be more likely to rely on their intuition when making decisions, as it is assumed that they do not have the time or sources of information to make more rational decisions. How then do the managers of small businesses that have adopted big data manage to balance this dichotomy of taking the time needed to find and consider the evidence versus responding to the pressures of their environment and allocating their scarce resources? What can other businesses, both small and large, learn from them?

Small businesses that have successfully adopted big data and big data analytics have shown through this research that the culture of the organisation, determined through the influence of the founder / MD / top management, affects the decision-making and entrepreneurial approaches used in an organisation. While a culture of evidence-based decision-making is necessary for big data adoption, there are still situations where the judgment and experience of the decision maker should form part of the evidence. Proactive and innovative organisations use experimentation as a risk management strategy when looking for opportunities to commercialise big data and big data analytics. They create novel business models by selling data- and analytics-as-a-service to customers. They also use big data sources to enrich their internal data, thereby improving their own decision-making. Of all the resources of the small business, its

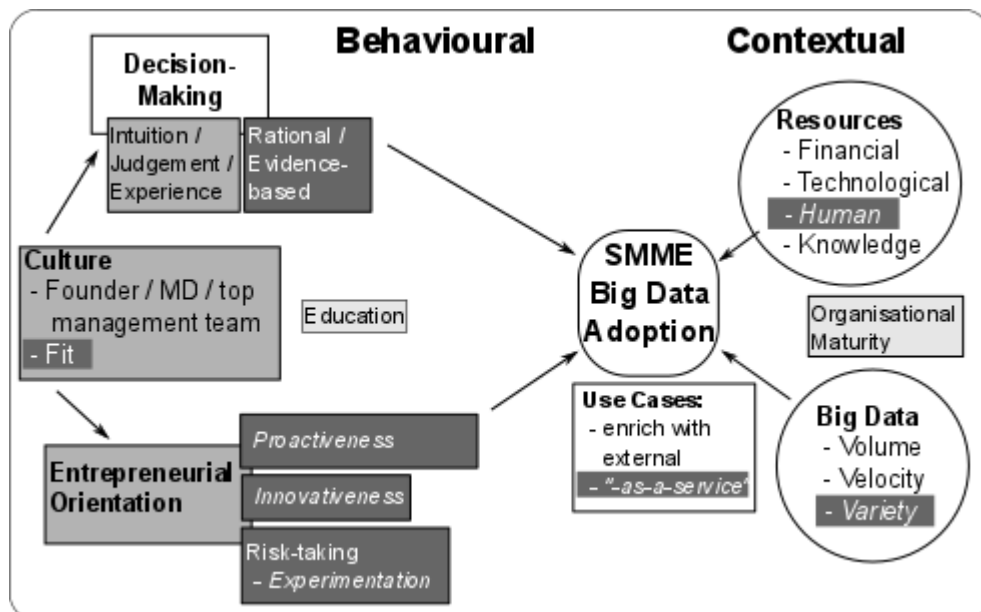
human resources, namely its people, are the most important. These are people who fit with the organisation’s culture, look for opportunities to commercialise big data sources and are able to deal with the challenges that come with the variety of data sources that big data offers. They do this by leveraging the external resources of other organisations, such as free online analytics tools, or cloud services and similar technologies. They remain lean and do not create large internal stores of information, unless they can find a way to commercialise that data.

7.2.2 SMME big data adoption framework

The entrepreneurial tendencies of small business, combined with a reputation for agility and being able to exploit niche markets, should place them in an ideal position to take advantage of the opportunities provided by big data and big data analytics. What should small business leaders then consider when looking to adopt big data and big data analytics in their organisations?

Figure 7.1 presents a framework based on the model in Figure 6.2, which presented the findings of this research in terms of the conceptual model from Chapter 2. Small businesses that are looking to adopt big data can use this framework to guide their thinking regarding the factors to consider in their own organisations and its context. The framework should be viewed from the left first, starting with the behavioural aspects and then from the right, looking at the context of the individual organisation.

Figure 7.1 – SMME big data adoption framework



It is also hoped that this framework will provide a basis upon which further research into the adoption of big data and big data analytics can be built.

7.2.3 Contributions to the literature

From the discussions of the findings of this research regarding the literature already presented as part of Chapter 6, the following primary contributions to the literature on big data adoption have been identified.

- The education of the leadership of the organisation was found to influence their decision-making preference (section 6.4.4). While education has been linked to decision-making before by Briner and Walshe (2014) and Charlier et al. (2011), its relevance to the adoption of big data has not.
- The use of experimentation as a risk management strategy (section 6.4.3), while suggested by the Lean Start-up method through the concept of the minimum viable product (Reis, 2011), has not been suggested as a means of managing the context of constrained resources in big data adoption in small businesses.
- While the impact of culture on the preferred method of decision-making in an organisation is highlighted in the literature (McAfee & Brynjolfsson, 2012; Ross et al., 2013), the role of the fit of the individual has not been linked to big data adoption (section 6.4.1).
- Based on the provided examples of the use of big data in large organisations by authors like Davenport (2013, 2014) and McAfee and Brynjolfsson (2012), the discovery of the “-as-a-service” business model (section 6.5.2) was not foreseen.
- Organisational maturity (section 6.7) has been used to define a capability maturity model that software development companies can use to improve their development processes (Paulk et al., 1993). However, it has not been linked to the adoption of big data in organisations before this research.

7.3 Implications for management

7.3.1 Small business

This research has identified a number of implications for the management of small organisations. The decision to adopt big data is more complex than merely a financial concern of the return on investment in a new technology. Managers need to consider the following factors:

- Is the culture of the organisation conducive to the adoption of big data?
- Do the business leaders encourage the use of the evidence in decision-making among their staff?

- Do the leaders of the business use evidence as part of their decision-making themselves?
- Does the organisation regularly use metrics in their management forums?

If the answer to any of these questions is no, then it is suggested that a small organisation should look at adopting a change management process that will encourage the use of evidence-based decision-making before investing any resources in big data analytics.

Once this has been accomplished, the next step would be to consider whether management's strategic and operational questions would be better answered through the use of the "little data" that they already have internally in their organisation (Ross et al., 2013, p. 92). However, if management sees an opportunity for the use of big data, then they need to consider their own internal resources:

- Does the organisation have sufficient technical skill available in their human and knowledge resources to implement a technology solution?
- If not, is the organisation aware of an external specialist who could provide the necessary guidance and skill to guide the organisation in the adoption of big data?

There are certainly instances where a small business does not have access to large internal sources of data. This may be due to their business model or the industry in which they operate. The small businesses in this research have shown that it is possible to aggregate data from external data sources, digest it and then sell it. Alternatively, they build the necessary skills internally to analyse and interpret other companies' data. Both of these are examples of the "-as-a-service-business" model.

Finally, the small businesses in this research have shown that they were able to adopt big data analytics, despite their constrained resources. By remaining lean and managing their risk-taking, through the use of experimentation, they proactively understand and meet their customers' needs and innovate new solutions. Small business managers must learn from this example and not let the lack of available resources prevent them from pursuing the myriad of opportunities that big data presents.

7.3.2 Large business

One of the implications of this research is the clear involvement of the most senior leadership in the adoption of big data analytics within the organisation. An implicit benefit of leaders' being involved in determining the decision-making and entrepreneurial culture is that once the decision has been made to adopt big data, small business leaders should be able to effect the changes necessary to do so.

Entrepreneurial middle managers in large organisations may face a different set of challenges beyond the resources required to adopt big data, given the reliance that general managers place on their own experience and intuition (Francis-Smythe et al., 2013). Convincing C-suite and their own colleagues of the need to use big data and evidence-based decision-making from the middle of the organisational hierarchy may prove difficult.

The suggestion in the media that large organisations should build “data lakes” (Woods, 2011) may actually end up hindering the potential of big data within large organisations. Data lakes are presented as massive stores of easily accessible data that are based on cheap storage. Data can be deposited in these lakes and once the organisation has identified the questions they need answered, they can then sift through this data. Obvious implications of this are that the data may possibly never be used, the value of the data decreases from the moment it is generated, and storing all this data in case it has value has an ever increasing fixed cost if the data is never deleted, to name but a few. Having the financial and technical resources available to build these data lakes may mean that large organisations' point of departure will set them up for problems in the future when these data lakes turn toxic. It is suggested that managers in large organisations should learn from the example set by the small businesses and begin with the question of how to commercialise their internal data sources, rather than hold on to data in the hope that it may provide value later on.

In addition, the research by Kwon et al. (2014) has shown that success with internal data sources may have a negative effect on management's intentions to acquire environmental information using big data. This may suggest that managers in larger organisations will be blinded to the opportunities that their entrepreneurial counterparts in small business are seizing and exploiting.

7.4 Limitations of the research

7.4.1 Conceptual limitations

The lenses adopted in this research were chosen based on the literature available and the arguments presented in Chapter 2. Some other concepts were identified that may have been relevant to answering the research questions posed in Chapter 1, but which were ultimately rejected in favour of reducing the overall complexity of the final conceptual model. A short discussion of the rejected concepts is presented here in terms of what they are and their potential applicability to the topic at hand.

First, organisational ambidexterity, as proposed by Tushman and O'Reilly (1996), suggests that firms that are able to exploit their existing markets while simultaneously exploring new opportunities may do better than firms that concentrate on one or the other. This involves a trade-off though, as resources that are normally dedicated to exploiting an existing market segment have to be diverted to try and exploit a new one. In a resource-constrained environment, this will require an element of risk-taking if the business owner were to take on a new opportunity. Given the recognised agility of small business and their reduced levels of hierarchy (Stokes & Wilson, 2010), it could be argued that they are better able to switch between exploring and exploiting than larger organisations. This would mean that they may be in a position to take advantage of an opportunity faster than larger organisations, or are able to exploit a niche opportunity that would not be economically viable to the larger organisations with their higher levels of overhead. It was envisaged that if small businesses were using big data and big data analytics to help them identify market niches or new opportunities, then this would give them an advantage over their larger competitors. As this concept related only to the big data use case of scanning the environment, a use which has ultimately been excluded based on the findings of this research, it was decided not to include this in the conceptual model discussed in Chapter 2. If, however, the technology advances to a point where it is, for example, as easy to use as Google Analytics, then organisational ambidexterity and the proposed use case of environment scanning may both become relevant.

Second, work by Rahman and De Feis (2009) suggested a model that positioned strategic decision-making methods according to the context of the decision itself, not the context within which the decision is made. The authors proposed a framework to organise the various strategic decision-making models into a two-by-two matrix, using complexity and time pressure as the two dimensions with which to categorise those

models. In a context of low time pressure and low complexity, the literature suggests that managers do not put in the same effort that they would in conditions of high complexity and/or high time pressure (Robbins & Judge, 2012). While determining how successful big data adopters overcame this tendency within their own organisation may help other organisations to switch to evidence-based decision-making. This was considered to be beyond the scope of this research.

Finally, there have been issues raised around the use of big data itself. Boyd and Crawford (2012) argue that in sufficiently large data sets there is the risk of “apophenia”, or seeing patterns in data where none actually exist (p. 668). Rather than adopt the position of whether or not big data is suitable for use in small business, it was decided to look at those small businesses that were already using big data and identify the common factors that had allowed them to do so.

7.4.2 Researcher bias

Exploratory research is subjective and is influenced by the researcher’s own perspectives. It is important that the researcher acknowledges those potential biases, as their context will have an influence on how they interpret the findings of the research (Creswell, 2014, p. 188; Saunders & Lewis, 2012). Therefore, it must be stated that the researcher has extensive experience working in IT in the insurance industry, both in the application development and business intelligence space and all while working for SMMEs. As a result, some of the interviews covered issues that are of a more technical nature, such as the software development life cycle the respondent was using, or some of the challenges they were solving that are particular to the insurance sector. This may have biased some of the answers given by the respondent or may have placed too much emphasis on a particular theme.

7.4.3 Sampling bias

The use of snowball sampling has resulted in a number of businesses that are involved in the insurance industry in some form – three of the nine respondents were in the insurance industry specifically and another one had developed applications for clients in the insurance industry. This may limit the transferability of this research to industries that are not as heavily regulated as the insurance and financial services sector in South Africa. In addition, no counterpoint has been provided in the form of the view of small businesses that have not yet adopted big data, which would have added a form of triangulation to the findings of this research.

7.5 Recommendations for future research

Having established a framework for managers in small business to use in considering big data adoption in their organisations, the next step would be to test that framework with the larger population of small businesses that have not yet adopted big data.

As highlighted in the implications for managers in large organisations in section 7.3.2, there is the question of whether departments in large organisations can use this framework to assess their own ability to adopt big data. Can the leaders of these departments display intrapreneurship and carve out their own culture and niche within the larger organisation?

Section 5.6.1 presented the following quote by GB, a Managing Director in the mature group, "...reputation is key. If not 25%, then more, of your business comes from word of mouth." This suggests that reputation and the need to understand customers' needs might be a push factor that drives the adoption of big data within small business. Understanding the effect of reputation management, as well as other push factors not identified during this research, would expand the understanding of why small business may actually need to adopt big data to remain competitive in their chosen markets.

Finally, understanding the implications of the new privacy legislation raised in section 5.7.6, and the use of data within the novel business models demonstrated within this research should be understood. Chapter 1 suggested that South Africa needs the contribution of small business if it were to reach its economic growth aspirations. For example, the opportunities that big data presents for small business may not be perusable if privacy restrictions prevent them from using the information that their customers may be making freely available on social media.

7.6 Conclusion

At the start of this research in Chapter 1, four questions were asked regarding the adoption of big data by small business. First, do small businesses that are going to adopt big data need a culture of evidence-based decision-making? Second, does the entrepreneurial culture of small business support their adoption of big data? Third, has the proliferation of online tools and cloud services made it easier for small business to adopt big data? Finally, what are the small businesses that are using big data using it for?

The findings of this research have established that evidence-based decision-making and a strong entrepreneurial orientation most definitely aid in the adoption of big data. The availability of cloud services and online tools has allowed small businesses to go beyond what is expected and to develop novel business models that allow them to provide data and analytical skills to much larger organisations. Their entrepreneurial leaders, along with their proactivity and innovativeness, are showing the way in terms of how to exploit the opportunities presented by big data, despite their organisations' constrained resources. In fact, it may be these very constrained resources that are pushing organisations to innovate in ways that their larger competitors may not even have thought of yet.

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Appendix 1: Ethical clearance

A copy of the ethical clearance received for this research has been provided for reference purposes.

**Gordon Institute
of Business Science**
University of Pretoria

Dear Gregory Potter

Protocol Number: **Temp2015-01217**

Title: **Big Data Adoption in SMEs: How do non-digital natives become digital immigrants?**

Please be advised that your application for Ethical Clearance has been APPROVED.

You are therefore allowed to continue collecting your data.

We wish you everything of the best for the rest of the project.

Kind Regards,

GIBS Ethics Administrator

Appendix 2: First interview discussion guide

Discussion Guide
<p>Grand Tour Questions:</p> <ul style="list-style-type: none"> - Tell me about your business - Tell me about your company's use of technology - Describe the type of people that work here - Describe the types of behaviours that you look for in your employees as a business
<p>Floating Prompts:</p> <p>Contextual:</p> <ul style="list-style-type: none"> - What does the company do? - Which industry does the company operate in? - Approximately how many employees do you have? - How many of them are managers? - What are their roles and do they have more than one role? <p>Decision-making:</p> <ul style="list-style-type: none"> - What do you base your decisions on? - Do you have any regular management meetings? <ul style="list-style-type: none"> o Is there any specific information that you look at during the meeting or outside of the meeting (before and after)? o Are there any specific metrics that you review regularly during those meetings? <p>Entrepreneurial Orientation:</p> <ul style="list-style-type: none"> - How easy is it for you to try new things? - Do you feel it is important to stay up to date with new developments or changes? - Have you had to take a risk on some new development or technology? <p>Big data</p> <ul style="list-style-type: none"> - What have you used big data to do specifically? - Have you had the necessary resources to use big data?
<p>Contrast prompts:</p> <ul style="list-style-type: none"> - Can you tell me about a difficult decision that you have had to make recently? <ul style="list-style-type: none"> o What made it difficult? o Did you have all the information you needed? o Did you have enough time? - If there was one thing that you could change, or an obstacle that you could remove, what would that be? - What does the business base its decisions on? Is this different to how you would

- normally make decisions?
- How much time do you spend on looking around outside the business versus what is happening inside your business?
 - Was there a risk that you took that did not work out for you? What did that mean for you and the business?

Appendix 3: Discussion guide used for interview 2 and 3

Discussion Guide
Grand Tour Questions: <ul style="list-style-type: none">- Tell me about your business- Tell me about your company's use of technology- Describe the type of people that work here- Describe the types of behaviours that you look for in your employees as a business
Floating Prompts: <p>Contextual:</p> <ul style="list-style-type: none">- What does the company do?- Which industry does the company operate in?- Approximately how many employees do you have?- How many of them are managers?- What are their roles and do they have more than one role? <p>Decision-making:</p> <ul style="list-style-type: none">- How does your company make decision?<ul style="list-style-type: none">o What happens when the pressure is on?- Do you have any regular management meetings?<ul style="list-style-type: none">o Is there any specific information that you look at during the meeting or outside of the meeting (before and after)?o Are there any specific metrics that you review regularly during those meetings? <p>Entrepreneurial Orientation:</p> <ul style="list-style-type: none">- How easy is it for you to try new things?- Do you feel it is important to stay up to date with new developments or changes in technology and your environment?- Have you had to take a risk on some new development or technology? <p>Big data</p> <ul style="list-style-type: none">- What have you used big data to do specifically?- Have you had the necessary resources to use big data?

- What is your most important source of information
- Do you process the data yourself (or do you use external services to process the data)

Culture

Environment Scanning

Contrast prompts:

- Can you tell me about a difficult decision that you have had to make recently?
 - o What made it difficult?
 - o Did you have all the information you needed?
 - o Did you have enough time?
- ~~If there was one thing that you could change, or an obstacle that you could remove, what would that be?~~
- What does the business base its decisions on? Is this different to how you would normally make decisions?
- How much time do you spend on looking around outside the business versus what is happening inside your business?
- Was there a risk that you took that did not work out for you? What did that mean for you and the business?

Preamble:

Thank you very much for your time today, it is very much appreciated.

Consent form complete?

I am doing research into small companies that are successfully using big data and am looking for what has enabled them to be successful with adopting big data. I would like to get a sense of how your company is using big data, for what (internal or external) and what challenges you have had using big data.

I am also trying to get a sense of how your business makes decisions, how your founder or management team feels about risk, how you keep up with what is going on in your environment, your industry and with technology.

I also would like to know about the type of people that work there, and what you are looking for in people that join the organisation.

Appendix 4: Interview guide for interview 5,6,7,8 and 9

Discussion Guide
Grand Tour Questions: <ul style="list-style-type: none">- Tell me about your business- Tell me about your company's use of technology- Describe the type of people that work here
Floating Prompts: <p>Contextual:</p> <ul style="list-style-type: none">- What does the company do?- Which industry does the company operate in?- Approximately how many employees do you have?- How many of them are managers?- What are their roles and do they have more than one role? <p>Decision-making:</p> <ul style="list-style-type: none">- How does your company make decision?<ul style="list-style-type: none">o <i>What happens when the pressure is on?</i>- Do you have any regular management meetings?<ul style="list-style-type: none">o Is there any specific information that you look at during the meeting or outside of the meeting (before and after)?o Are there any specific metrics that you review regularly during those meetings? <p>Entrepreneurial Orientation:</p> <ul style="list-style-type: none">- How easy is it for you to try new things?- Do you feel it is important to stay up to date with new developments or changes in technology and your environment?- Have you had to take a risk on some new development or technology?- Describe the types of behaviours that you look for in your employees as a business <p>Big data</p> <ul style="list-style-type: none">- What have you used big data to do specifically?- Have you had the necessary resources to use big data?- What is your most important source of information- Do you process the data yourself (or do you use external services to process the data) <p>Staff</p> <ul style="list-style-type: none">- Do you do any induction training?

Contrast prompts:

- Can you tell me about a difficult decision that you have had to make recently?
 - o What made it difficult?
 - o Did you have all the information you needed?
 - o Did you have enough time?
- What does the business base its decisions on? Is this different to how you would normally make decisions?
- How much time do you spend on looking around outside the business versus what is happening inside your business?
- Was there a risk that you took that did not work out for you? What did that mean for you and the business?

Appendix 5: Initial Coding Scheme

age of company analytics behaviours big data constraints context culture dashboards data use: EXT data use: INT decision-making definition effect:: negative effect:: positive entrepreneurship environment sensing evidence experience external feedback financial fit formal generalist gut feel importance:: critical importance:: high importance:: low	importance:: medium induction training industry informal innovation internal intuition management team market knowledge market segment marketing mature maturity maturity: MA maturity: ST maturity: SU mentions metrics network number of employees number of managers numbers operational people proactiveness problem solving process quotable quote	reports resources risk-taking sentiment analysis social media source of information specialist stable start up strategic tactical technology time tool use web analytics
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Appendix 6: Final Coding Scheme

(AT) (BL) (DT) (FM) (GB) (JA) (RJ) (RV) (SC) *all items in the Culture and Fit family *all items in the data family *All Respondents *decision-making CO-OCCUR data / data: / metrics... *decision-making CO-OCCUR experience /opinion /intuition *experience / opinion / intuition agility* analytics analytics as a service* ANSWER answer: no answer: unsure answer: yes behaviours big data cloud services* competitors* CONTEXT context: age of company context: management forums context: management team context: number of employees context: number of managers core competency* culture customer: education* customer: experience* customer: feedback* customer: maturity* customer: needs* customer: relationships* customer: service* customer: value add* customer: word of mouth* dashboards data data as a service* data: access* data: blending* data: digest*	data: not available* data: quality* data: relevance* data: scientists* data: use data: validity* decision-making definition development team* EFFECT effect:: constraint effect:: enabler effect:: none environment scanning EO EO: innovation EO: proactiveness EO: risk-taking EVALUATE evaluate:: ambivalent evaluate:: challenge* evaluate:: difficult* evaluate:: easy* evaluate:: negative evaluate:: positive evidence experience experimentation* external financial fit focus* Google Analytics* IMPORTANCE importance:: critical importance:: high importance:: low importance:: medium induction training industry integrity* internal intuition KPI* lean start up* market knowledge market segment marketing marketing: offline* marketing: online* MATURITY maturity: MA maturity: ST maturity: SU metrics minimum viable product* network	niche* numbers opinion page ranking* people POSITION position: CTO position: MD position: MKT position: TL process question<->answer* QUOTABLE QUOTE reports resources sentiment analysis social media source of information systems thinking* technology technology adoption: compatibility* technology adoption: leading edge* time tool use TYPE OF type of: formal type of: generalist type of: informal type of: operational type of: specialist type of: strategic variety velocity volume web analytics
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Appendix 7: Ethical Considerations: Consent form given to each participant at the start of the interview.

I am conducting research on the use of big data in SMMEs. Our interview is expected to last about an hour, and will help us understand how small businesses can and have used big data. Your participation is voluntary and you can withdraw at any time without penalty. Of course, all data will be kept confidential.

The contents of the interview may be made publicly available, in the form of an MBA thesis, without your name or any other personal details except gender and age being referred to.

If you have any concerns, please contact me or my supervisor. Our details are provided below.

Researcher name: Greg Potter

Telephone: [REDACTED]

Email: 459898@mygibs.co.za

Research Supervisor: Kerry Chipp

Telephone: 0117714000

Email: chipk@gibs.co.za

Signature of participant: _____

Date: _____

Signature of researcher: _____

Date: _____