



Big data for small businesses: Abstracting security and decision-making tools

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Abstract

The study delineates the understanding of big data as an emergent phenomenon that has brought a notable shift in the relationship between technology and business decision-making. Using grounded theory techniques, the study espouses opportunities and alternative perceptions from small businesses regarding the value that big data may offer in contrast to usage experience by big businesses. Information security lies at the heart of these consideration. The study draws on concepts and tenets from the discipline of information security to support a theoretical underpinning for big data usage in small businesses. A substantive theory has been developed from this work with three distinct concepts emerging that show that financial consideration, management mindset and size consideration play a big part in influencing small business perceptions.

1 Introduction

Small businesses are increasingly recognizing the opportunities big data may offer by providing untapped new insights for decision making as well as profits. This makes big data, an increasingly valuable asset (Chiang, Grover, Liang & Zhang, 2018). Big data has potential influence in many spheres of industry, big and small, by providing accurate solutions in the age of digital transformation and effective data management (Lim, Kim & Maglio, 2018). Many small businesses currently battle to build and implement effective data strategies that would help leverage the potential use of big data (Potter, 2015). Although, most big businesses have put measures to realize potential for big data through effective big analytics, small business seems to struggle to implement big data solutions. This study is therefore inspired by the lack of potential and limited studies for small business adoption of big data (Johan Rising, Kristensen & Tjerrild-Hansen, 2014; Potter, 2015). An outcome of this study is to shed new insights regarding how small businesses can benefit by implementing big data strategies. Although this recommendation may sound daunting to small business owners, particularly in Africa, the reality, is that many small businesses already have mechanisms in place to collect significantly large amounts of data from numerous platforms, with less upfront investment (Potter, 2015). This is due to the large available number of open source platforms.

Despite lack of resources, small business can take advantage of big data analysis (Franco, 2017). Small business can now claim that it is timely to be equal players in the big data space. It is now the right time for small businesses to start looking for ways big data can benefit decision making, growth and profitability (Adams, 2018). In reality, it is much easier presently for small business, previously left out of the big data rush, to engage with the new affordable online analysis tools to leverage big data (Adams, 2018). Indeed, small businesses have been known to be quicker and more agile in exploring marketplaces than their larger counterparts (Potter, 2015, Adams, 2018).

The study explores this discourse as follows. Section one has introduced the main idea concerning how big data traditionally useful in the domain of big businesses can transcend into small businesses. Literature around big data usage by big businesses is considered as well as how this can shift to small business use. Grounded theory techniques useful in qualitative research is applied to espouse opportunities and perceptions regarding the value of big data to small businesses. This is done by drawing on usage experience and on concepts and tenets from the discipline of information security. This is explained in the methodology section of this work. The penultimate sections draw on useful understanding regarding unique perceptions small businesses have and the work is concluded.

2 Literature: Big Data in Small Businesses

Big data considers the big five v's namely as: velocity, volume, value, variety, and veracity (McAfee, Brynjolfsson, Davenport, *et al.*, 2012). One of the reasons behind the lack of a proper discourse and framework for big data usage in small business intuitively lies on how small business make decisions and the type of data they use to do so. Small business owners tend to make decisions based on instincts, loosely on past experience, or both (Heskett, 2013). In addition, small business decisions are often tied to feelings (Franco, 2017). Intuitive decision-making without grounds for logical support lies at the heart of small businesses. Intuitive decision making may be addressed by having a data strategy as a first step towards being logical and data driven (Franco, 2017). Data strategy is seen as more than simply investing in a data warehouse, and would involve having a plan that should help business growth by determining the best Information Technology (IT) investment needed currently and, in the future, and by protecting small business sensitive data (Franco, 2017). The fast pace and growth of emergent and often at times disruptive technologies has made many small businesses struggle to keep up. Small business may find themselves investing on new data analysis technology, only to find out they have ended up investing in a technology that did not suit their small business needs.

Having a solid data strategy has been found to solve such problems. A solid data strategy for a small business may include identifying the types of data needed, identifying from which source and what analysis tools could be used and how data will be stored. This means a data strategy for a small business must be coupled with its core strategy for business. Simply put, data strategy starts with the business strategy, by understanding what the small business is trying to achieve. Data strategy would be useful for small businesses to help understand customers' needs and to improve the business' ability to provide products and services. Decision making for small businesses should be a top priority for implementing data analysis technology (Franco, 2017).

2.1 Big data and Security

While harnessing the power of big data may offer potential excitement, and more serious benefit to businesses, pertinent data governance questions may arise, such as how small businesses may get the best out of big data while not risking privacy and security. The issue around trust and data mining

algorithms used in big data has arisen in the recent past. There is a considerable massive number of online sources and algorithm that are now untrustworthy (Zhang,2018).

2.2 Big data analytics opportunities for small businesses

There are big data analytical tools available on the market targeted for small businesses which are now more intuitive and easy to use. Analytical tools now make it easier for non-data native users to leverage complex analytics, scaled at small businesses (Polkowski,Khajuria, & Rohadia, 2017). Indeed, developers now realize the importance of making these analytical tools readily available for different groups of people across different business sizes. This “democratization” of data access has opened up opportunities for small businesses to apply modern technology in big data analysis to their business operations (Polkowski, Khajuria & Rohadia, 2017). Some of these analysis tools that would commonly be used by small businesses (with the exception of *IBM Cognos Analytics™* 11.1) are shown as an example by Table 1: While there are numerous other tools present in the market, Table 1 presents the more popular of these (Polkowski,Khajuria & Rohadia, 2017).

Technologies open for Small Businesses	free	Company size -small	Security and privacy
<i>Google analytics™</i>	✓	✓	✓
<i>InsightSquared™</i>		✓	✓
<i>IBM Cognos Analytics 11.1™</i>			✓
<i>Sales Manago™</i>	✓	✓	✓

Table 1: Big data analytics tools used by small businesses

Google analytics™

This is a free platform provided by *Google™* to collect and measure data concerning behavior users’ behaviour when visiting websites (Plaza, 2011). Business of all sizes can therefore get to understand how their customers behave when visiting the business website. Small businesses specifically measure users’ interaction on the website, and the duration stayed. Data collected can for instance determine which part of the website attracts most traffic. Sematic analysis is a feature that can help determine using lexicons, the most searched words (Batinca & Treleaven, 2015).

InsightSquared™

Although not free, *InsightSquared™* is a tool that can help small business with making accurate decision-making about customer preferences by generating visual sales reports (Roberge, 2016). This could be helpful for small business to anticipate their customer future needs, and also in making better sales and marketing strategy.

Cognos analytics 11.1™

Cognos analytics 11.1™ is a platform that enables business to analyze their data intelligently using visual interaction helps in discovering patterns and meaning of the particular business data (Volitich, 2008). Predicative analysis is a feature in the tool that can assist in decision making, strategic planning and risk management (Ayhan, Pesce, & Comitz, *et al.*, 2012).

*SalesManago*TM

*SalesManago*TM is a platform offers marketing solution to business of all sizes, by collecting information of the websites users, and help in building full user profile, which will then be used to marketing the correct service and product to the right person and right time (Błażewicz, 2012).

As mentioned above, there are plentiful data analysis tools available in the market, either free or at an affordable price that can be used by small businesses. Market-oriented small businesses are able to leverage big data tools for market planning and in order to constantly offer higher levels of customer value and service (Donnelly, Simmons, Armstrong, & Fearne, 2015). These tools are actually better suited to small businesses over big businesses. These tools could be of value to small businesses due to the flexibility small businesses have in making such tools suit their data needs. The next section explores the context of small businesses operating in South Africa in the Gauteng region and the underlying perceptions these businesses have towards using big data.

3 Methodology

Using techniques borrowed from grounded theory (GT), the study sought to understand opportunities and alternative approaches that big data may offer to small businesses. This understanding was confined to qualitative data elicited from employees working in small businesses. The data was used to derive emergent concepts described in the next section.

3.1 Emergent Concepts

The GT approach, strongly embraced in the IS discipline (Wiesche et al., 2017), was useful in allowing the researchers to collect qualitative data and from this data, concepts would emerge which would be used and allow theories to emerge from the data (Dezin & Lincoln, 2011). The GT approach has also been applied to information security and privacy research (Njenga & Brown, 2012). The steps followed are systematic although can be followed in a flexible way. As the qualitative data is collected and coded, connections are drawn from these codes then a theory or theories emerge. In this approach, the researchers did not have predefined theories regarding big data usage in small businesses but rather allowed the interviewees to explain their own unique experiences. Interpretive approach to GT was used which explained that the meaning behind the contexts spoken of by the interviewees elicited from raw facts was gained through thick descriptions (Pickard, 2012). What emerged from data and interpreted by way of analyzing data immediately before waiting until all data are collected guided the next step and is referred to as emergent design (Creswell & Poth, 2017). This approach was used to understand perspectives of big data use by small businesses, not necessarily anchored to previously studied theoretical frameworks (Matavire & Brown, 2013).

3.2 Semi structured interviews

In order to elicit unique experiences occurring in context, semi structured interviews were used to collect qualitative data. An interview schedule guided the elicitation process. Ideas that would help develop new theories were conceptualized at these stages as new thoughts and ideas regarding the use of big data in small businesses emerged. Interviews helped explore employees' understanding of big data analytics. 20 interviewees working in small businesses across Johannesburg area of Gauteng province, in South Africa were interviewed. Interviewees were encouraged to open up and to speak freely about the use of technology and big data. Interviews were tape recorded and were transcribed precisely as they were recorded (verbatim).

4 Codes and Analysis

Codes were theorized based on the interviewees presentation of experiences. Initially, codes were developed from the transcripts and then these codes were reviewed in order to arrive at inter-coding reliability. The following sections are extracts from the research that present and summarizes important findings. From the interviewee’s qualitative data, codes were derived and then categories formulated through a process known as constant comparative analysis. This is shown in Figure 1, which represents the process of breaking up qualitative data. From the interview transcripts, open codes and axial codes were generated. The most important codes were then selected. This is known as selective coding. Finally, what was obtained was a preliminary draft theory, which later was compared to literature and a more substantive theory emerged.

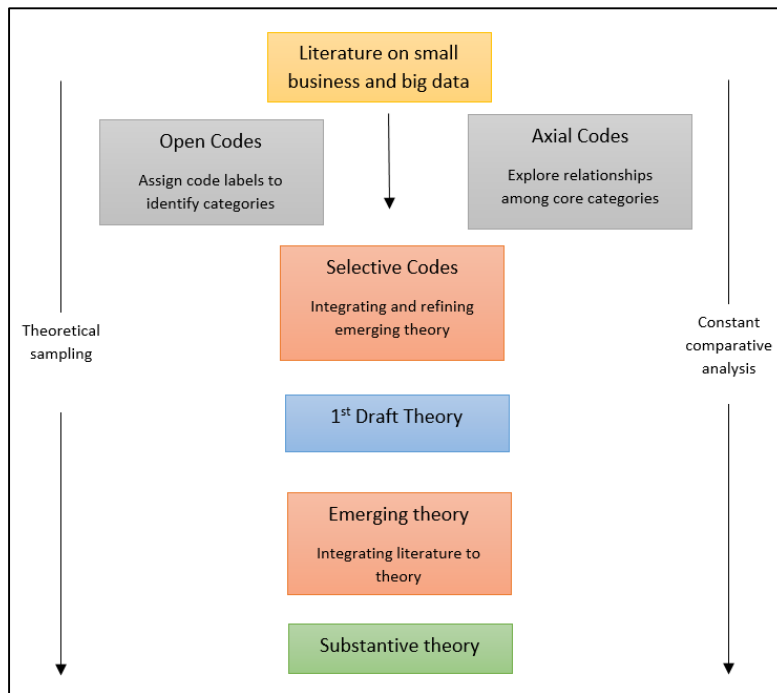


Figure 1: Process of coding

4.1 Discussions

The following sections discusses findings that emanated from the coding process. Four distinct concepts emerged from the codes namely; intuitive decision making, lack of awareness, low self-efficacy and expensive tools. These four shaped the response interviewees regarding the potential for small business to use big data and big data tools for decision making. We discuss these four from selected extracts of qualitative data that most the coding process as follows:

Intuitive decision making

Intuitive decision making was observed and supported by the one of the interviewees, who expressed the following:

“although I know the importance of big data analysis but still, I take most of my decision without data analysis well I don't want to say based on intuition but rather based on my exercise and traditional way of doing data analysis, and I'm doing good”.

While decision based on intuition are common in small businesses and can work, the nature of big data may not allow for this, making this approach problematic. With good data planning and strategy small business can then use big data tools profitably to avoid intuitive decisions. The following three open codes were identified: *importance of big data analysis, based on intuition, traditional way.*

Lack of awareness

Irrespective of the lack of awareness about big data potential for small business, the lack of technology education and the understanding of security and privacy threats, small businesses may adopt tools embedded with these features to assist small businesses. It was observed that interviewees did not know this as expressed by one interviewee:

“I'm a business graduate not an IT graduate... I'm not really comfortable on using technology for decision making... I know I can hire someone but that costs a lot... and I don't trust working with freelancers and give them my data”.

The above interviewee was a business graduate who expressed trust concerns regarding using big data analytics tools. Although the interviewee understood the importance of data analysis, the thought of using big data outside of the traditional way he was accustomed to, did not cross his mind. The prevalent belief at the time was that big data analytics remained in the domain of big business. The following three open codes were identified: *not comfortable, don't trust, my data.*

Low self-efficacy

It was observed that certain interviewees presented low self-efficacy which tended to disclose the manner of potential effort they would exert towards understanding and using technology such as big data. The kind of effort required was observed to be insufficient and would tend to lead to unsuccessful outcomes in using big data analytics. This was expressed by one interviewee as follows:

“I'm not that good at using technology as your millennials.... My business is doing well; I don't have to spend lots of money to hire analysts.... I don't think I need this in my business... at least not at this stage”

The above interviewee believed that technology was difficult, complicated and costly to invest in. The thought of even hiring someone to deal with it was not considered as an alternative. She affirmed through her thinking that big data was the preserve of big businesses. The following three open codes were identified: *not good at using technology, I don't think I need, not at this stage.*

Expensive Tools

The challenge to small businesses understanding big data is for these to formulate the right questions to extract meaning out of the large size of data available from various platforms. Small businesses suggest impediments to using these tools as expensive and costly (Katal, Wazid, & Goudar, 2013). Small businesses may feel constrained to collect and store large quantity of data even though these may not identify the immediate value (Marx, 2013). Some of these sentiments were expressed as follows:

“whenever I think about big data tools and technologies, I always think about how much it's going to cost me: will I be able to afford it for a small business?”

While small businesses may not realize that there are many tools that can be cost effective, many may rationalize wrongly, due to what they perceive as their size. The following three open codes were identified: *it's going to cost me, afford it, small.*

From the discussions with the interviewees it was observed that one of the main issues that would impeded small businesses into adopting big data analysis and embedding tools as part of core processes is the lack of awareness about the free resources available as well as the potential benefits these tools present. Lack of financial resources was also pointed out as a key concern. Finally, interviewees also suggested that they would be uncomfortable using technology they did not trust. This was interpreted to mean that interviewees expressed security and privacy concerns. Table 2 presents a summary of open and selective codes generated from the above discourse.

Open Codes	Selective Codes
<i>importance of big data analysis, based on intuition, traditional way.</i>	Intuitive decision making
<i>not comfortable, don't trust, my data.</i>	Lack of awareness
<i>not good at using technology, I don't think I need, not at this stage.</i>	Low self-efficacy
<i>it's going to cost me, afford it, small.</i>	Expensive Tools

Table 2: Open and Selective codes

4.2 Substantive theory

From the summary discussions with interviewees' presented, a preliminary substantive theory shown by Figure 3 was developed. The substantive theory is derived from a network analysis of open codes shown by Figure 2. This preliminary theory serves as a model of a "working theory" of presenting opportunities for small businesses to use big data. The substantive theory from this work is considered transferable. The work in its present form does not aim at elucidating a formal theory the would require validity, and generalization across multiple studies of big data in small businesses but in presenting what was observed.

From the codes obtained a network diagram was developed that linked the various codes in interesting ways to see if a picture or pattern emerged. This is shown by Figure 2. *Atlas.ti*TM a qualitative analysis software was used to qualitatively analyze network of codes for interesting patterns existing within these codes. What was developed as an outcome of this exercise was a network diagram of three distinct concepts.

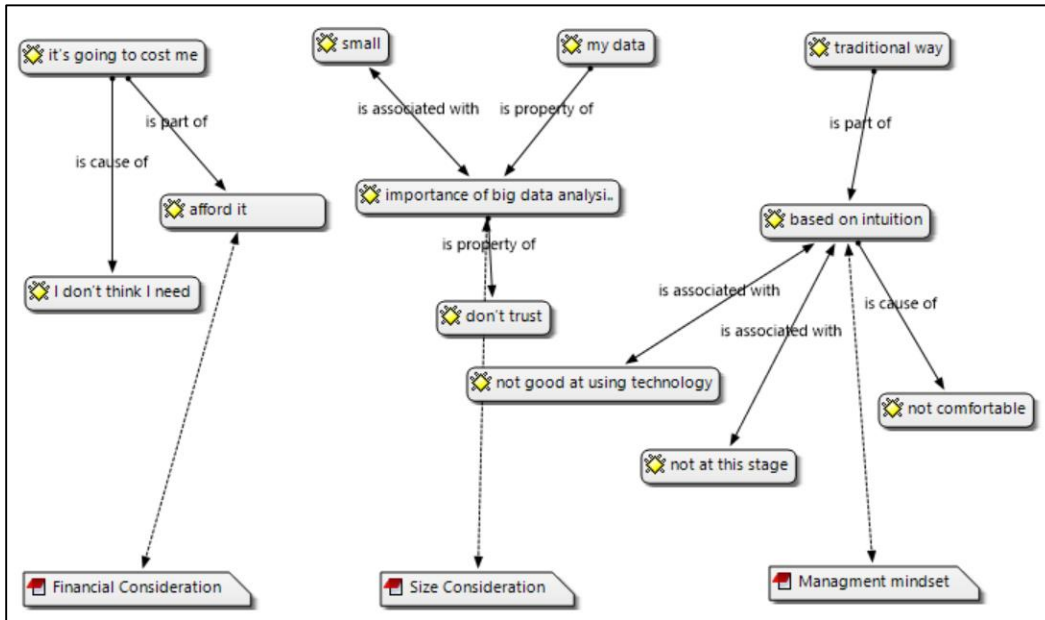


Figure 2: Network diagram of three distinct concepts

A substantive theory was then developed from the network analysis in Figure 2. Three distinct concepts emerged which were shown to influence the uptake of big data by small businesses. These three include: *Financial consideration*, *Management mindset* and *Size consideration*. From the network diagram, it was observed that expensive tools moderated financial consideration, while intuitive decision making, lack of awareness and low self-efficacy moderated the management mindset. This is presented by Figure 3 which shows the substantive theory of big data in small businesses.

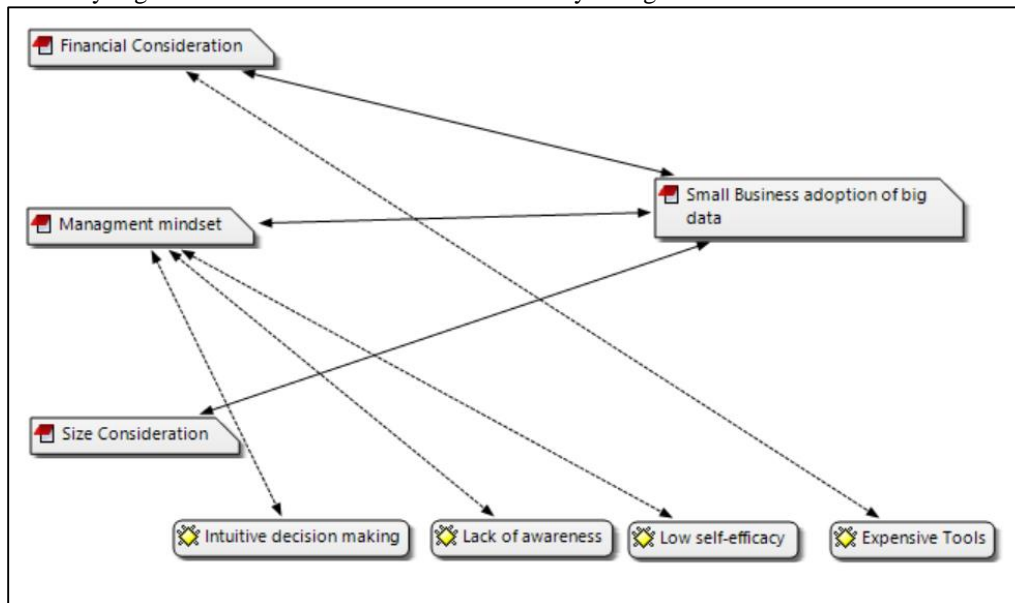


Figure 3: Substantive theory of big data in small business

The substantive theory may have value to small business owners who may acquire deeper insights concerning their use of big data tools in their small businesses. What this model presents are useful yet interesting ways that can help small business realize their true potential. The model presents and advocates for a shift in mindset, size consideration and financial consideration by small business owners.

5 Conclusion and recommendation

Based on data obtained from interviewees', the study has found that small business owners in South Africa are primarily driven by financial considerations, their predisposed mindset as well as the assessing the size of their business in determining the adoption of big data tools and big data for decision making. This was arrived at by a careful analysis of what the interviewees were saying. The mindset is a prevailing consideration that needs to change by increasing awareness about the importance of big data analytics to business process and the decision making. Since small business represent more than 90% of the South African economy, the researchers feel that if a large proposition of these businesses' awareness levels are raised, the impact to the economy will be felt.

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