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How leadership style and behaviour influence decision making and enhance big data decision-making capability

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Abstract

Big data is the proliferation of data from various sources because everything is connected, and this contributes to a rich data trail of customer behaviours and needs, machinery or processes. Leaders are increasingly exploring how to create and extract value from big data by enhancing their organisation's decision-making capability. Big data is considered to be a valuable, rare, imperfectly imitable, and non-substitutable (VRIN) resource for the organisation and a source of competitive advantage, as described in the resource-based view of the firm. Big data being a VRIN resource is not sufficient in itself to result in higher quality decisions that consequently provide a competitive advantage. Leaders play a vital role in the orchestration of several resources to enable their dynamic capabilities and enhance the organisation's big data decision-making capability.

This research posits that leadership style influences big data decision-making capability and that there is not a single optimal style; leaders rather have to dynamically shift between optimal blends of leadership styles as determined by the context and the specific follower. These optimal blends of leadership styles are made up by a combination of transformational, transactional, and pragmatic leadership styles supplemented with leadership self-identities and contextual leadership. A conceptual model to guide the leaders in which blend of styles to focus on to enhance their big data decision-making capability has been developed during this research.

Leaders need to paint an unconstrained picture of a future in which big data driven decisions are used and unite the team to become data-driven. In order to sustain the benefit from big data after the vision has been set, the leader needs to support by utilising execution, relational, and intellectual stimulation skills. This will be supported by aligning leadership style and behaviour to the context and incorporating the community.

Consequently, leaders should not aspire to a single leadership style, like transformational leadership, or discourage transactional leadership, but rather acknowledge that a blend of leadership styles is required to enhance big data decision-making capability. Leaders should not be stuck in the world of business intelligence, and machine data, and miss all the benefits that big data could add to their business. Leaders need to start dreaming big where data-driven decisions are concerned and have the courage to take the first step or increase their pace of big data adoption.

Keywords

Big Data, Big Data Decision-Making Capability, Decision Making, Leadership Style, Leadership Behaviour

List of abbreviations and acronyms

Table 1: List of abbreviations and acronyms

Abbreviation	**Meaning**
AI	Artificial Intelligence
BD	Big Data
BDAC	Big Data Analytic Capability
BI	Business Intelligence
CEO	Chief Executive Officer
COVID-19	Disease caused by the SARS-CoV-2 (2019-nCoV) coronavirus
CSR	Corporate Social Responsibility
ERP	Enterprise Resource Planning
GM	General Manager
KPIs	Key Performance Indicators
MBA	Master of Business Administration degree
MBE	Management by Exception
MD	Managing Director
RFID	Radio-Frequency Identification
RQ	Research Question
SMEs	Small and Medium-sized Enterprises
SVP	Senior Vice-President
VP	Vice-President
VRIN	Valuable, Rare, Imperfectly Imitable, and Non-substitutable

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.

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1. Introduction

1.1. Research problem

Big data is used to describe large, fast-moving and complex streams of data, and it has become a significant talking point for strategic leaders to improve their decision-making capability (Janssen, van der Voort, & Wahyudi, 2017). Leaders are increasingly exploring how to create and extract value from big data by enhancing their organisation's decision-making capabilities (Janssen et al., 2017; Mikalef, Krogstie, Pappas, & Pavlou, 2020; Zeng & Glaister, 2018). This ability to improve the quality of their decisions from large structured and unstructured datasets through analytics that includes statistical models, advanced mathematics and machine learning, depends on how well leaders obtain and orchestrate their resources (Akhtar, Frynas, Mellahi, & Ullah, 2019). Sources of the data include online machinery, control systems, smart devices, stock markets, photos, videos and social media posts (Akhtar et al., 2019; Ghaeini, Antonioli, Brasser, Sadeghi, & Tippenhauer, 2018; Miah, Vu, Gammack, & McGrath, 2017; Sena, Bhaumik, Sengupta, & Demirbag, 2019). Leaders are now more interested in these data sources, and this interest is fuelled by Artificial Intelligence (AI) and the fact that a large variety of these sources can be obtained without extensive investment (Sena et al., 2019).

Consequently, leaders are moving from intuition-based decisions, what we think we should do, to more data-driven decisions, what we know the data tells us to do (Abbasi, Sarker, & Chiang, 2016; Brynjolfsson & McElheran, 2016; Gupta & George, 2016; McAfee & Brynjolfsson, 2012). An example of this move to become more data-driven is that big data plays an important role in industry 4.0, the German developed plan for the fourth industrial revolution (Shamim, Zeng, Shariq, & Khan, 2019). Although the use of big data has a proven track record of having an impact on the competitive advantage of an organisation (Gendron, Yeoh, & Swarr, 2014; Mikalef et al., 2020; Pigni, Piccoli, & Watson, 2016; Wamba et al., 2017), big data as a resource is not enough on its own to result in higher quality decisions that consequently results in a competitive advantage (Mikalef, Boura, Lekakos, & Krogstie, 2019). In other words, organisations will not achieve a competitive advantage solely because they have access to large amounts of data and powerful analytics, they also need leaders who can lead their team to expose the gems hidden in the data (Shamim et al., 2019). The advantage that can be gained by insights brought forward by big data could be lost if the leadership team

does not recognise the potential of those insights (Gupta & George, 2016). Leaders can also enhance big data decision-making capability by creating a favourable environment (Shamim et al., 2019). The environment and climate that leaders are creating through their leadership style is the starting point for creating the required resource configuration and collaboration that is difficult to imitate (Gupta & George, 2016; Shamim et al., 2019). Leaders within the organisation have an impact on how and when decisions are made because leaders focus on strategic matters and the way decisions are implemented (Shamim et al., 2019). Leaders thus have an essential role to play in orchestrating the resources to find concealed prospects with strategic value (Migliore & Chinta, 2017).

The required leadership style for this orchestration of resources is mostly unknown, and leaders are unsure what areas of leadership are essential for developing their decision-making capabilities (Abbasi et al., 2016; Migliore & Chinta, 2017; Mikalef et al., 2019). For this research, it was decided to focus on the leadership style needed to create value from big data by improving the leader's decision-making capability. This research seeks to explore the elements of the different leadership styles that influence data-driven decision-making capabilities. As Shamim et al. (2019) indicated, the contingency theory of leadership posits that leaders can change their leadership styles to achieve the desired results. By exploring transformational, transactional, and pragmatic leadership styles (Anderson & Sun, 2017; Judge & Piccolo, 2004), supplemented by leadership self-identities (Anderson & Sun, 2017) and contextual leadership (Oc, 2018), this research aimed to guide leaders to utilise the identified leadership style elements to enhance the orchestration of resources so that they can improve their decision-making capability. The research outcome hopes to enhance leaders' decision-making capabilities and ultimately, the organisation's competitive advantage.

Janssen et al. (2017) define big data decision-making capability as the organisation's ability to collect, prepare and analyse large volumes of structured and unstructured data in order to make high-quality decisions. Janssen et al. (2017) label the bidirectional interaction between collecting, preparing, analysing and deciding as the big data chain. The quality of decisions is affected by every part of the big data chain, and often these parts are situated in different silos of the organisation or even originating from external parties in the business ecosystem (Janssen et al., 2017; Zeng & Glaister, 2018). The elements of the big data chain affect each other, therefore collaboration is crucial (Janssen et al., 2017). This research explored what elements of leadership styles can enhance the quality of the decisions by focusing on this collaboration between the different parts of the data chain.

Gupta and George (2016) define a similar construct as big data analytic capability (BDAC), where the organisation needs a unique combination of tangible, human, and intangible

resources to enable them to make quality decisions. Gupta and George (2016) list BDAC as a third-order construct with tangible, human, and intangible resources as its second-order constructs. Managerial skills are then one of the first-order constructs that also include data, technology, basic resources, technical skills, culture and organisational learning. This research has focused on how leadership styles could influence managerial skills to ultimately improve the leader's contribution to the organisation's BDAC.

1.2. Purpose statement

This research explored the role of leadership styles in the big data decision-making capability of an organisation. A qualitative research approach was used, that included interviews with executive level management to gain a deeper understanding of the influence that leadership styles have on the big data decision-making capability of an organisation.

The theoretical lenses of the resource-based view (Barney, 1991) and the dynamic capabilities view (McKelvie & Davidsson, 2009; Teece, 2018; Teece, Pisano, & Shuen, 1997) were used to ground the exploration. The resource-based view has been selected because to achieve a sustainable competitive advantage the leader needs to orchestrate the resources to be Valuable, Rare, imperfectly Imitable and Non-substitutable; these attributes are referred to as VRIN (Gupta & George, 2016; Zeng & Glaister, 2018). The dynamic capabilities view compliments the resource-based view because it talks about how the organisations need to respond, through the guidance of the leader, to make sure the VRIN attributes of their team stay relevant (Shamim et al., 2019; Teece, 2018). An in-depth review of how these two theoretical lenses support the research on the influence of leadership styles on the big data decision-making capability of an organisation will be discussed in the next chapter.

1.3. Scope of the research

The scope of the research were restricted to understanding the influence different aspects of leadership styles have on the big data decision-making capability of an organisation. Only transformational, transactional, and pragmatic leadership styles (Anderson & Sun, 2017; Judge & Piccolo, 2004) from the contemporary leadership style literature were evaluated. This restriction of leadership styles was based on the similarities between the other emerging leadership styles, as indicated by Anderson and Sun (2017). To supplement the contemporary leadership styles, the leadership self-identities (Anderson & Sun, 2017), and contextual leadership (Oc, 2018), were used to evaluate how leaders can behave in a different manner, depending on the situation.

1.4. Academic rationale

The role of leadership to leverage big data for a competitive advantage has been identified by Abbasi et al. (2016) as a research opportunity to extend the existing literature to ultimately answer the larger question of “How does analytical leadership emerge?” (Abbasi et al., 2016, p. xiii). Mikalef et al. (2019) added to this call by noting that the way resources are orchestrated to enhance BDAC remain mostly unknown, thus this research has explored the leadership style required to enhance BDAC to build on the literature on how resources are orchestrated. While many of the research studies on factors influencing BDAC and big data decision-making capabilities find that management and leadership are essential, it is still unclear which specific leadership styles are required (Gupta & George, 2016; Shamim et al., 2019). This research aimed to follow the lead of these research suggestions and fill this gap in the literature by exploring which leadership styles enhance the BDAC and big data decision-making capability of an organisation.

1.5. Business rationale

The way managers make decisions are also important; they need to be willing for the data to lead them. McKiernan (2003) pointed out that “managers' past success imbues them with a decision-making arrogance." (p. 775). When leaders have more guidance on which leadership styles will enhance their decision-making capability, then they could counter their decision-making arrogance. The Cynefin framework (Snowden & Boone, 2007) “helps leaders determine the prevailing operative context so that they can make appropriate choices” (p.4). Snowden and Boone (2007) grouped the different domains into ‘simple’, ‘complicated’, ‘complex’ and ‘chaotic’. Within the four domains, the leaders need to use different combinations of ‘sensing’, ‘categorising’, ‘acting’, ‘analysing’ and ‘responding’ to make the appropriate decision. Being more data-driven and being able to enhance big data decision-making capability through the adequate use of leadership styles will assist with the ‘sensing’ and ‘analysing’ at the needed stage, as suggested by the Cynefin framework.

1.6. Conclusion

This chapter has introduced the importance of exploring the role that leadership style has on the big data decision-making capabilities of an organisation. Chapter two will give an overview of the literature as it relates to big data, resource-based view and dynamic capabilities as well as big data decision-making capabilities and leadership styles. Chapter three details the research questions and chapter four elaborates on the research methodology that will be used. The results will be detailed in chapter five and discussed in chapter six. Finally, a conclusion and suggestions for further research will be discussed in chapter seven.

2. Literature review

2.1. Introduction

This chapter will present an overview of the literature as it relates to leadership styles and big data decision-making capabilities. This chapter starts with a definition of big data and then focuses on the two theoretical lenses that were chosen, and the applicability thereof on the influence leadership styles and behaviour have on big data decision-making capabilities. Contemporary leadership styles will be discussed next, followed by leadership self-identities and how context affects leadership behaviour.

2.2. Definition of big data

Although there is no harmonious agreement regarding the definition of big data, most opinions agree that it is not only a large amount of data (Sena et al., 2019). The initial 3Vs model (Beyer & Laney, 2012) posits that the data requires to be gathered at high-'volumes', with high-'velocity' and have high-'variety' in order to be regarded as Big Data. 'Velocity' measures the speed at which the data is generated, 'volume' is the amount of data supplied from every data source while the 'variety' dimension refers to the range of different data sources involved in the data generation (Chen, Chiang, & Storey, 2012). Beyer and Laney (2012) noted that although the volume of big data is the first thing you might think about, today's big volume becomes tomorrow's normalised volume and the focus should instead be on the other requirements of big data. Regarding the 'velocity' dimension, Akoka, Comyn-Wattiau, and Laoufi (2017) contextualised the rate of this data gathering by indicating that 5 exabytes were generated before 2003 and the same amount of data was generated every second day in 2012. To expand on the 'variety', Cisco estimated in 2017 that 50 billion devices would be connected to a network in 2020 (Akoka et al., 2017), and the 'variety' of these devices would be generating high-'volume' and high-'velocity' data.

As the big data concept grew, four additional Vs were added to the characteristics of big data, namely 'veracity', 'value', 'variability' and 'visualisation' (Mikalef, Pappas, Krogstie, & Giannakos, 2018). 'Veracity' indicates the "biases, noises and abnormality of the data" (Sena et al., 2019, p. 220). 'Value' describes what insights business can gather from the data (Mikalef et al., 2018). 'Variability', or volatility, as Chartier (2016) lists it, describes how big data can vary over time (Beyer & Laney, 2012). The variability can also be seen in how news reports, also considered to be a source of big data, can result in different interpretations even if it is the same information, depending on who reports on it (Mikalef et al., 2018). The concepts of these additional four Vs can also be seen in the comment from Beyer and Laney (2012), that

"It is still necessary to manage the quality, perishability, classification and appropriate use of data contracts to ensure fidelity and allow for linked data" (p. 5).

Additional to these seven Vs, big data can also be divided into structured and unstructured datasets (Akhtar et al., 2019). Structured data can be obtained from machinery, control systems, radio-frequency identification (RFID) tags, and other more measurable sources like financial records and markets (Akhtar et al., 2019; Ghaeini et al., 2018; Gupta & George, 2016; Miah et al., 2017). Unstructured data sources include social media posts, videos, photos, emails and tweets (Akhtar et al., 2019; Miah et al., 2017). Although the analytics on unstructured data is complex, the analytic capabilities on unstructured data sets have rapidly increased (Beyer & Laney, 2012; Gupta & George, 2016). Structured and unstructured data have been used to enhance decision making (Janssen et al., 2017).

As a summary, big data is large, fast-moving and complex streams of data that consist of structured and unstructured formats "which makes them difficult to handle using traditional techniques" (Janssen et al., 2017). The required data capturing and analytics techniques for extracting value from big data will be discussed next.

2.3. Big data decision-making capability

Organisations need to build big data analytic capabilities by combining and utilising several organisational resources to be able to improve their decision-making capability and improve their competitive advantage (Gupta & George, 2016). As Janssen et al. (2017) submit, there are several models in the literature that describe the process from capturing the data to making the decision. For example, one model lists the challenges related to the "collection, storage, management, manipulation, cleansing, and transformation" (Zhou, Chawla, Jin, & Williams, 2014, p. 70) of the data, while another model lists five steps as defining the problem, searching for the data, transforming the data, resolving the entity of the data, answering the query and solving the problem (Bizer, Boncz, Brodie, & Erling, 2012). More models have been identified in other literature, but for this research, the 'big data chain' by Janssen et al. (2017) has been selected to reflect on all the aspects that can affect big data decision-making capability. The big data chain consists of four subsequent parts that are distinguished analytically, with bidirectional interaction between the parts (Janssen et al., 2017), which are defined as collecting, preparing, analysing and deciding. These parts of the data chain could be situated in different silos of the organisation or even originate from external parties in the business ecosystem (Janssen et al., 2017; Zeng & Glaister, 2018). The leader has to orchestrate the collaboration between the links of the chain, and the leadership style required was explored in this research. In any effort to improve the quality of decisions taken based on the data, there

may be many efforts to optimise the separate parts of the chain. These changes affect each other, hence the analogy of a chain (Janssen et al., 2017). An example of this effort to improve the quality, is when team members are "removing noise, converting selected datasets into machine readable and linked data and adding meta-data" (Janssen et al., 2017, p. 338). During these changes to the big data streams, the hidden value in the data can be lost and consequently the decision-making quality will decline; it is thus essential to manage all stages of the big data chain (Janssen et al., 2017). Big data decision-making capability is thus not only affected by a small number of data scientists, but by the quality of every link in the chain and by the collaboration between the links (Gupta & George, 2016; Janssen et al., 2017; Shamim et al., 2019).

BDAC is a similar construct to big data decision-making capability. Gupta and George (2016) described BDAC as being dependant on the organisation's ability to combine tangible, human, and intangible resources to enable them to make quality decisions. Managerial skills then support the human resources component of their model, and it is organisational specific (Gupta & George, 2016). Gupta and George (2016) mentioned that "mutual trust and a good working relationship between big data managers and other functional managers will likely lead to the development of superior human big data skills, which will be difficult to match by other firms." (p. 1053). How leadership style could enhance these difficult to imitate superior human big data skills was the focus of this research.

2.4. The resource-based view and dynamic capabilities

The role of the leader in the big data chain can be tied to the 'human-in-the-loop', as explained by Migliore and Chinta (2017). Migliore and Chinta (2017) emphasise that the involvement of leaders in the big data value creation process is essential because they need to understand the data and the ethics that need to be applied. As elaborated by Gupta and George (2016), orchestrating resources to establish superior big data skills that are difficult to imitate by competitors, is how an organisation can establish a competitive advantage. In terms of the resource-based view, an organisation must have control over the resource in order for it to contribute to the organisation’s competitive advantage. As the leader has control over the resources, the resource-based view has been selected as the first framework to ground the exploration of the role of the leader in optimising the benefits of big data chain. The potential competitive advantage offered by big data has been evaluated by Sena et al. (2019), Batistič and van der Laken (2019) and Gupta and George (2016). The resource-based view posits that an organisation's competitive advantage stems from resources that are not easily replicated (Barney, 1991). The VRIN characteristics of the organisation's resources, as detailed in the introduction of this report, is what the leader of the organisation must focus on

to establish the competitive advantage (Gupta & George, 2016). The resource-based view does not mention capabilities explicitly, but does specify that the resources should be owned and controlled by the organisation (Amit & Schoemaker, 1993; Gupta & George, 2016). The organisation does own its resources that have big data decision-making capability, thus it can be seen as a VRIN resource in the resource-based view (Gupta & George, 2016; Shamim et al., 2019).

This competitive advantage will not be sustainable over time if it is not constantly evolving (Gupta & George, 2016; Shamim et al., 2019). Because of this, the dynamic capabilities approach complements the resource-based view to make sure the competitive advantage stays sustainable (Batistič & van der Laken, 2019; Shamim et al., 2019). Dynamic capabilities emphasise that big data can create competitive advantage in a dynamic environment through enhancing "the firms' capacities to integrate, build, and reconfigure internal and external resources/competencies to address and shape rapidly changing business environments" (Katkalo, Pitelis, & Teecey, 2010, p. 1177). As Mikalef et al. (2018) indicated, "dynamic capabilities reformulate the way a firm operates and competes in the market—a process referred to as evolutionary fitness" (p. 560). When exploring which leadership styles contribute to the big data decision-making capability, the requirement of evolutionary fitness suggested by dynamic capabilities was kept in mind.

The resource based view provides the strategic support for the argument that big data generates value as a resource, and the dynamic capabilities view supports the leaders in operationally integrating results from big data analytics into their decision-making. Sena et al. (2019) noticed that firms that were successful in this were able to "sense, learn, coordinate, integrate and reconfigure their capabilities in response to a challenging environment, using their data resources in a timely manner" (p. 224). It is thus essential to not only focus on the resource-based view of a firm, but also make sure the firm has dynamic capabilities to benefit from the potential advantages presented by big data decision-making.

When looking at big data decision-making capabilities, Akhtar et al. (2019) found that multidisciplinary teams enhance the firm's ability to exploit the benefits of big data. Through research done on 240 big data subject-matter experts, Akhtar et al. (2019) also concluded that firms that manage to focus on big data driven actions do "perform better compared to those that do not focus on such applications and relevant insights." (p. 252). Akhtar et al. (2019) have also used the resource-based view as a framework for their research and mentioned that "specific managerial actions to leverage big data skills that are rare and difficult to imitate" (p. 266) are required. For this research, the leadership styles required to influence the managerial actions were explored, thus a review of applicable leadership styles will be discussed next.

2.5. Contemporary leadership styles

The critical role of the leader in orchestrating the resources has been highlighted by Shamim et al. (2019). The contingency theory of leadership indicated that the leader could influence the performance of the organisation by selecting the appropriate leadership style (Oberer & Erkollar, 2018; Robbins, Judge, Millett, & Boyle, 2013; Shamim et al., 2019). Leadership style is defined as a particular mixture of behaviours, traits and skills that leaders use to interact with their followers (Oberer & Erkollar, 2018). The two contemporary leadership styles that were initially selected for this research are transformational and transactional leadership. The selection of these two contemporary leadership styles was based on the similarities between the other emerging leadership styles, as indicated by Anderson and Sun (2017). These two leadership styles will now be briefly discussed, after which a short discussion is given of other emergent leadership styles that were not extensively examined due to the finding of Anderson and Sun (2017).

2.5.1 Transformational leadership

Although transformational and charismatic leadership are often defined as separate leadership styles in the literature, Fiol, Harris, and House (1999) stated that "the similarities among these theories are, in our opinion, far greater than their differences" (p. 451). Anderson and Sun (2017) support this claim that charismatic leadership overlaps with transformational leadership. As detailed below, Judge and Piccol (2004) added charisma as a dimension of transformational leadership, supporting the argument that the two leadership styles can be combined. For this reason, charismatic leadership will be discussed separately to highlight some of its original characteristics as recorded in the literature, but then it will be combined with transformational leadership for the rest of this research report.

Charismatic leadership

Charismatic leadership has been modelled since 1974, and many scholars have contributed to this leadership style (Conger, 1999). Charismatic leaders are seen as people who are able to paint a picture of a desirable future and inspire their followers to contribute to this future, even if it is detrimental to the followers themselves (Anderson & Sun, 2017). Conger and Kanungo (1994) list five factors in their model that defines a charismatic leader, these are “being sensitive to constraints, threats and opportunities in the external environment, articulating an appealing strategic vision, taking personal risks, exhibiting unconventional behaviour, and being sensitive to follower needs” (Anderson & Sun, 2017, p. 77). Such a

leader displays a healthy self-confidence, is passionate, does not prioritise self-interest, behaves in an admiral way, sets high expectations from followers and shows confidence that these expectations can be met (Anderson & Sun, 2017).

Observations were made that charismatic leaders do sometimes act unethically and promote their self-interest. Two distinctive types of charismatic leaders were identified, namely socialised and personalised charismatic leaders (Howell & Shamir, 2005). Socialised charismatic leaders do not focus on self-interest, but empower and develop their followers, and they strive to a vision that is optimal for the collective (Anderson & Sun, 2017; Conger, 1999). Personalised charismatic leaders maximise self-interest by being the boss that manipulates followers, and they have a high need for power that is caused by low self-esteem (Anderson & Sun, 2017; Conger, 1999). These characteristics of charismatic leadership will now be incorporated into transformational leadership.

Transformational leadership

Transformational leaders use long-term goals and focus on the greater good to influence their followers (Judge & Piccolo, 2004). The four dimensions of transformational leadership are "charisma, inspirational motivation, intellectual stimulation and individualised consideration" (Judge & Piccolo, 2004, p. 755). The charisma dimension integrates charismatic leadership with transformational leadership, and in that way that the leader sets an example for the followers to admire and identify with the leader. Charisma has also been called the 'idealised influence' of leaders that links to another leadership style called ethical leadership (Anderson & Sun, 2017). Honesty and trustworthiness are some of the cornerstones of ethical leadership Brown and Treviño (2006), together with Anderson and Sun (2017) posit that this is where ethical leadership and transformational leadership overlap. Similarly to the socialised and personalised types of charismatic leaders, Bass and Steidlmeier (1999) also make a distinction between two types of transformational leaders, namely pseudo- and authentic transformational leaders. The pseudo transformational leader aligns with the personalised charismatic leader, and the authentic leader aligns with the socialised charismatic leader. Bass and Steidlmeier (1999) added that "a moral foundation of legitimate values" (p. 184) is at the core of an authentic transformational leader. These traits of an authentic transformational leader are seen to encompass ethical leadership characteristics.

As part of the inspirational motivation dimension, the leader sets a clear vision, communicates aspirations, challenges the team members to follow higher standards, and gives meaning to the daily tasks (Anderson & Sun, 2017; Judge & Piccolo, 2004). The third dimension is intellectual stimulation, in which the leader strives to make sure that the team take risks, challenge assumptions, support and explore team ideas and "stimulate and encourage

creativity in their followers" (Judge & Piccolo, 2004, p. 755). The fourth dimension of transformational leadership is individualised consideration that describes the leader's focus on the individual needs of his followers, and the leader acts as a mentor to followers (Judge & Piccolo, 2004).

The four dimensions of transformational leadership encompass the five factors that were listed in the model of a charismatic leader by Conger and Kanungo (1994) in the beginning of this section. This again supports the argument by Anderson and Sun (2017) "to abandon the distinction between charismatic and transformational leadership" (p. 78).

Mumford and Van Doorn (2001) found that transformational leaders are better suited to government organisations and not optimally suited to industrial organisation. This concept was explored in this research to investigate if it is beneficial for enhancing big data decision-making capability.

2.5.2 Transactional leadership

Transactional leadership is in contrast with transformational leadership and is focused on the transactions of proper resources between the leader and the follower (Judge & Piccolo, 2004). With transactional leadership, the followers will do something that the leader wants so that they can get something from the leader that they want (Judge & Piccolo, 2004). Transactional leadership has three dimensions. The first is contingent reward, that describes how the leader will set up positive transactions to encourage the followers to do what is required and ties a reward to the followers for obtaining what is required (Judge & Piccolo, 2004). Podsakoff, Bommer, Podsakoff, and MacKenzie (2006) expanded contingent reward into four separate concepts, which are contingent reward and punishment, and non-contingent reward and punishment. The use of contingent reward and non-contingent punishment correlated with overall performance and workplace satisfaction (Podsakoff et al., 2006). Contingent reward was used as a single overarching concept as the first dimension of transactional leadership in this research report. Goodwin, Wofford, and Whittington (2001) added that this contingent reward dimension includes two separate factors, namely explicit and implicit psychological contracts. These psychological contracts contain the formally communicated or uncommunicated conditions that the transactional leader has with his followers (Anderson & Sun, 2017). Goodwin et al. (2001) found that the implicit psychological contract is associated with the behaviour of a transformational leader.

The next two dimensions of transactional leadership both include management by exception (MBE), the one is active, and the other is passive. MBE is defined as "the degree to which the leader takes corrective action on the basis of results of leader–follower transactions" (Judge

& Piccolo, 2004, p. 755). Active MBE is when the leaders are proactively reacting on problems; the leader will typically monitor the followers closely and take corrective action in sufficient time before it creates problems (Anderson & Sun, 2017; Judge & Piccolo, 2004). With passive MBE, leadership will wait for a problem and then react to the behaviour (Anderson & Sun, 2017; Judge & Piccolo, 2004).

2.5.3 Other emerging leadership styles

After reviewing other emerging leadership styles that included value base leadership, servant leadership, authentic leadership, ethical leadership and spiritual leadership, it was decided not to discuss them in this research report because the overlaps with transformational and transactional leadership styles were substantial, according to Anderson and Sun (2017). However, due to the applicability of pragmatic leadership on big data decision-making capabilities, this leadership style will be discussed.

Pragmatic leadership

Charisma is not an essential characteristic for a leader to be successful (Pasternack & Toole, 2002), often a more problem-orientated and practical leader is required, which Mumford and Van Doorn (2001) called a pragmatic leader. In-depth knowledge about the business, focus on efficient ways to reduce cost and other practical know-how characterise this leadership style (Anderson & Sun, 2017). A pragmatic leader also needs extensive knowledge about the social aspects of his organisation and know his stakeholders and their expectations (Anderson & Sun, 2017). A pragmatic leader is associated with subject matter expertise, high intelligence, critical thinking and wisdom (Anderson & Sun, 2017). Antonakis and House (2014) argue that this type of leadership style must be added as a dimension to the transformational leadership style. They labelled the additional dimension as instrumental leadership and explicitly stated that it is the same as pragmatic leadership. Where a charismatic leader uses vision-based approaches when difficult situations arise, pragmatic leaders focus on finding the root cause of the problem and set achievable goals to resolve it (Mumford, Antes, Caughron, & Friedrich, 2008). Identifying how big data can enhance decision making would require such practical leadership skills.

Anderson and Su (2017) elaborated that the characteristics of leadership styles do tend to overlap, and there is a need for a 'full range' leadership theory that focuses on the leadership self-identities. The five leadership self-identities that Anderson and Sun (2017) refer to will be discussed in the next section.

2.6. Leadership self-identities

Leadership behaviour can be explained by using a socio-cognitive approach to explain how leaders can behave in a deferent manner, depending on the context situation (Anderson & Sun, 2017). Hannah, Sumanth, Lester, and Cavarretta (2014) argue that this invalidates the need for predefined leadership styles. Leaders instead use multiple self-identities that can be triggered by specific contexts (Sun, 2013). These self-identities are "visionary, relational, creative, manager and community-orientated" (Anderson & Sun, 2017, p. 90).

The leader with the visionary self-identity can paint a desirable picture of the future that include personal values and standards (Anderson & Sun, 2017), whereas a leader with a relational self-identity is authentic, demonstrates ethical behaviour and emphasises transparency. Such a relational self-identity leader will, moreover, be focused on the need of others (Anderson & Sun, 2017). It must also be mentioned that these relational self-identity leaders could have relational orientations that are either focused on themselves in terms of the group (a relationist orientation) or focused on the group only (a collectivist orientation) (Cooper & Thatcher, 2010). The creative self-identity can be found in, as the name suggests, creative individuals. They are stimulated by creative problem solving and doing things in new ways (Anderson & Sun, 2017). Individuals with the manager self-identity view themselves as good managers, being efficient at organising, regard themselves as task-orientated and are able to control outcomes (Anderson & Sun, 2017). These manager self-identity leaders promote explicit contingent rewards and need structure to control their environment. The community-orientated self-identity leader is focused on the greater good of the community; they see themselves as a member of the community above all (Sun & Anderson, 2012).

Anderson & Sun (2017) emphasise that any of the five self-identities can manifest itself in a single leader, depending on the context and situation. For this research, the leadership self-identities required to enhance big data decision-making capabilities will be explored.

2.7. Effect of context on leadership style

The two contemporary leadership styles, transformational and transactional leadership, are part of a leader-centric approach to leadership research and aim to explain leader behaviours that make them more effective than other leaders (Lord, Day, Zaccaro, Avolio, & Eagly, 2017). Leadership self-identities and contextual leadership theory seek to incorporate the influence of context into the leader function (Anderson & Sun, 2017; Oc, 2018). The context in which leaders function do impact on their attitudes and behaviours, and leaders will thus change the

leadership style used based on the situations they find themselves in (Oc, 2018). “Leadership does not occur in a vacuum, but rather exists in a context where leaders function” (Oc, 2018, p. 218). Contextual leadership has been a popular field for research in recent days, but there is not yet a systematic approach nor an agreement on what defines the context that affects leadership (Oc, 2018). While investigating the impact of context on organisational behaviour, Johns (2006) proposed a categorical framework for context that grouped context into the omnibus and a context level. Oc (2018) expanded on this categorical framework for context to define how context affects leadership. The omnibus level includes the broader aspects of the context or environment, and this level focuses on questions like ‘what?’, ‘why?’, ‘who?’, and ‘when?’ (Oc, 2018). Examples of the specific characteristics that were included under every sublevel are shown in Figure 1 below. Additionally, Johns (2006) added the occupation of followers under the ‘who?’ sublevel. The discrete level included the ‘task’, ‘social’, ‘physical’, and ‘temporal’ sublevels of the context (Oc, 2018). Figure 1 illustrates the omnibus and discrete levels of context and how it influences leadership outcomes through the leadership influencing processes (Oc, 2018). The discrete context is often described as being nested inside the omnibus level, in other words, the ‘where?’, ‘who?’ and ‘when?’ context will be affected by the ‘task’, ‘social’, ‘physical’ and ‘temporal’ context factors (Johns, 2006; Oc, 2018). There is a bidirectional effect between both context levels together and the leaders influencing process (Oc, 2018). Both the omnibus and contextual level in parallel have an impact on the outcomes of the leadership process (Johns, 2006; Oc, 2018). These two levels and seven sublevels were considered when analysing the data gathered for this research.

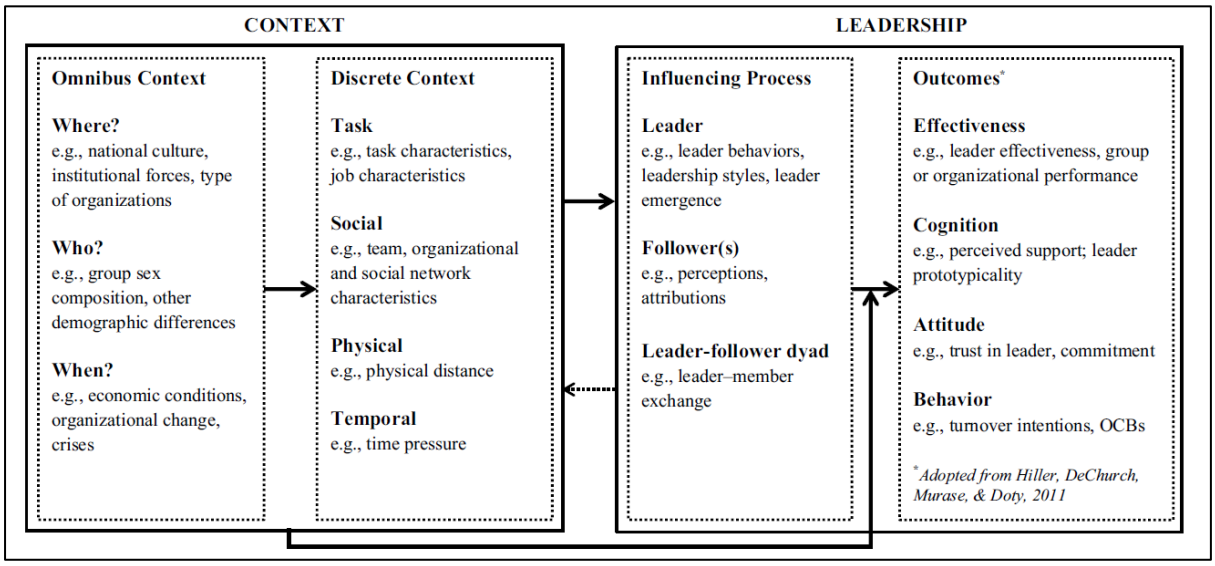

Figure 1: Framework of how context affects leadership interactively affect each other
Source: Oc (2018)

2.8. Conclusion

Two contemporary leadership styles have been discussed, followed by an argument that the emerging leadership styles are not different enough to be handled separately in this research. Only pragmatic leadership was aditionaly considers from all the emerging leadership styles. The five self-identities identified by Anderson & Sun (2017) and two context factors identified by Oc (2018) have instead been used to explore leadership behaviour associated with the enhancement of big data decision-making capabilities. The research questions based on this literature review will be discussed next.

3. Research Questions

3.1. Introduction

In this chapter, the research questions that form the basis of this study are presented. These questions have been informed by the literature review in chapter two. These questions will guide the exploration to identify the required leadership styles to enhance organisation's big data decision-making capability.
The main research question is:

How can leadership style enhance
big data decision-making capability?

3.2. Research question 1

How are the four dimensions of transformational leadership influencing big data decision-making capabilities?

The four dimensions of transformational are "charisma, inspirational motivation, intellectual stimulation and individualised consideration" (Judge & Piccolo, 2004, p. 755). How can these help a leader to create a data chain that enhances the organisation's big data decision-making capability?

3.3. Research question 2

How are the three dimensions of transactional leadership influencing big data decision-making capabilities?

Transactional leadership has three dimensions: *contingent reward, a*ctive MBE and passive MBE (Anderson & Sun, 2017). How can these help a leader to create a data chain that enhances the organisation's big data decision-making capability?

3.4. Research question 3

How are the leadership self-identities influencing big data decision-making capabilities?

A leader can have any combination of the five leadership self-identities based on the situation (Anderson & Sun, 2017). These leadership self-identities are "visionary, relational, creative, manager and community-orientated" (Anderson & Sun, 2017, p. 90). How can these help a leader to create a data chain that enhances the organisation's big data decision-making capability?

3.5. Research question 4

How can a leader utilise different behaviours in different contexts *to influencing big data decision-making capabilities?*

Oc (2008) did propose that the effect of context on leadership should be grouped into the omnibus and discrete levels. The omnibus level includes the ‘where?’, ‘who?’ and ‘what?’ categories of the context and the discrete level included ‘task’, ‘social’, ‘physical’, and ‘temporal categories’ of the context (Oc, 2018). How can different behaviours in different contexts help a leader to create a data chain that enhances the organisation's big data decision-making capability?

3.6. Conclusion

This chapter listed the research questions that helped to guide this qualitative research. The answers to these questions were analyses to get a better understanding of the way that leadership style can enhance big data decision-making capability. The methodology that was followed in the research will be discussed in the next chapter.

4. Research methodology

4.1. Introduction

An overarching qualitative methodology was used to explore in how leadership style can enhance big data decision-making capability. This choice of methodology and other aspects of the research design will be discussed in this chapter. The choice of population, sampling method and size, measurement instrument, data gathering process and analysis approach have been designed to support the robustness of the research. Each of these will be discussed along with the process of quality control and the identification of the limitations of the research.

4.2. Research design

The philosophy of this research was interpretivism because investigating how leadership style can enhance big data decision-making capability focused on social phenomena that were occurring in a natural environment (Saunders & Lewis, 2018). Each leader had a unique approach to how they see themselves within a leadership style or their combination of the five leadership self-identities based on the context they are in, and thus interpretivism has assisted in exploring how different leaders act as social actors. Interpretivism has also been selected because the researcher has brought his own interpretation to the interviews, and the analysis of the data, based on his experience and beliefs (Saunders & Lewis, 2018).

During the literature review, a deductive research approach (Saunders & Lewis, 2018) was followed to clarify the concepts behind big data, big data decision making, resource-based view, dynamic capabilities, leadership styles, leadership self-identities and contextual leadership. During the analysis of the interview data, an inductive research approach was taken because this research aimed to build on the limited theory that was available (Saunders & Lewis, 2018; Woiceshyn & Daellenbach, 2018). Cassell and Symon (2011) also elaborated on the suggestion from Alvesson and Deetz (2000) that "qualitative research has become associated with many different theoretical perspectives, but it is typically oriented to the inductive study of socially constructed reality, focusing on meanings, ideas and practices, taking the native's point of view seriously" (p. 633). How leadership style can enhance big data decision-making capability is in the general field of human behaviour and concerns a social process and its meaning, therefore a qualitative research method was best suitable for this research process (Pugna, Duţescu, & Stanila, 2019; Saunders & Lewis, 2018). The researcher interpreted the data from the interviews and explored why leaders use data to make decisions. From the interview data, the researcher sought to identify how specific leadership styles can be identified to enhance big data decision-making capability.

A qualitative design was selected instead of quantitative because the knowledge, experiences and opinions of the leaders that were interviewed were important, and by using a traditional Likert-based questionnaire, the different distinctive data from the participants would have been lost (Pugna et al., 2019). How leaders use data to make decisions were explored and this called for an exploratory study (Saunders & Lewis, 2018) to find the out how, and not to verify that, leaders are using data to make decisions. The study was not testing a set of empirical reasons by quantitative research. Birkinshaw, Brannen, and Tung (2011) argue that qualitative exploratory research is more suitable for "inductive theory building and hypotheses generation" (p. 573). The researcher was directly involved and embedded within the phenomenology of the research topic, and a qualitative research method was best suitable for the process of interpreting results (Pugna et al., 2019). Following this argument, the explorational research to discover how leadership style can enhance big data decision-making capability further confirmed that this research study had to be of a qualitative nature (Saunders & Lewis, 2018). A single data collection method was chosen to allow the researcher to get an in-depth understanding of how leadership styles could enhance big data decision making capability and discover new insights (Saunders & Lewis, 2018). Qualitative research is a naturalistic process, in other words the topic has naturally unfolded through the research process and was not predetermined by controlled conditions (Patton, 2014). Bloomberg and Volpe (2019) elaborated that qualitative research is ideal for obtaining an in-depth understanding of activity with the emphasis on exploration and discovery. This research was explorative and aimed to clarify and define the nature of how leadership styles can enhance big data decision-making capability (Zikmund, Badin, Carr, & Griffin, 2013). This type of exploratory research is required when new and unexplained areas are identified in a field of study, and the researcher is looking to provide clarity on why a phenomenon is occurring (Saunders & Lewis, 2018; Zikmund et al., 2013).

The researcher conducted semi-structured interviews with the executive leadership of organisations to gain new insights on how they could adjust or use different leadership styles to enhance big data decision-making capability. During these interviews, open-ended questions were used to encourage the discussion rather than leading questions that could be have directed the interviewee to comment on pre-existing theory (Hsieh & Shannon, 2005). Although the leadership theories formed the bases of the discussion, and the participants were encouraged to give their own opinion, the theories were used to anchor the discussion to leadership and not drift off to more technical aspects of big data. These leadership theories that was used to guide the discussion was transformational, transactional, pragmatic and contextual leadership, supported by leadership self-identities (Anderson & Sun, 2017). During these semi-structured interviews, the researcher used an interview schedule to guide the

discussion. The sequence of these topics and questions was not important and only guided the interview, depending on the responses (Saunders & Lewis, 2018). The study was cross-sectional because the data was collected from a wide range of groups and segments of the population in a relatively short period (Saunders & Lewis, 2018, p. 130; Zikmund et al., 2013).

4.3. Population

The population that was identified as being relevant for this study included executive and senior managers of large corporate firms, and small and medium-sized enterprises (SMEs). Executive and senior managers have been identified because they are central decision-makers where the strategy is concerned and the involvement of "central decision-makers in the formulation of strategy not only improves the quality of strategy but also its execution" (Van den Steen, 2017, p. 4546). Exploring the leadership style of these central decision-makers during the interviews was thus essential to discover how big data decision-making capability could improve the formulation and implementation of a data-led strategy. The emphasis was on firms that do not have big data and analytics as part of the core of their business model, examples of firms that were not considered are Uber, Waze, Google and Take-a-lot. In other words, organisations that were born digital were excluded. The reason for this exclusion was because the influence that big data has on their strategy was clear and therefore fell outside the ambit of this study. Leaders of consultancy firms that were supporting big data implementation in non-digitally born companies were included to make sure that the big data expertise and insights from previous big data projects were included. Leaders in corporate firms, as well as SMEs that have products and services that are not traditionally associated with big data, were included. The focus was not only on leaders in one industry nor only on corporate firms but also included SMEs because there were several examples of where big data played a role in the performance of SMEs (Sena et al., 2019). SMEs have been defined as organisations with less than 200 employees, an annual turnover of less than R 64 million and capital assets that do not exceed R10 million (Du Toit, Erasmus, & Strydom, 2009).

4.4. Unit of analysis

The unit of analysis defines who or what, and at what specific level of account, data should be analysed (Zikmund et al., 2013). Srnka and Koeszegi (2007) emphasised that correctly identifying the unit of analysis is an important initial step in the research process, and the research question determines the selection of the unit of analysis. For this research, the unit of analysis was the individual perceptions and opinions of executive and senior managers of large corporate firms and SMEs. These individual perceptions of the leaders were at an

adequate level to explore how their leadership styles and behaviours influence big data decision making capability.

4.5. Sampling method

The type of sampling technique that was used was non-probability sampling because no list of the population was available (Saunders & Lewis, 2018). Within this sampling type, purposive and snowball sampling were used.

Initially purposive sampling was used to start the data gathering process. The researcher's judgement was used to select the most suitable candidates to interview in order to achieve the goals set by the research (Saunders & Lewis, 2018). As noted by Bloomberg and Volpe (2019), purposive sampling ensured that the participants in the research would have insight into and an understanding of the phenomenon that was explored. The researcher used his informal network to compile a list of leaders who had a good understanding of big data and had a proven track record in enhancing their big data decision-making capability. For further interviews, snowball sampling was used when the initial participants recommended other appropriate candidates to help answer the research questions. This referral process was critical in obtaining access to key stakeholders in exploring how leadership styles are influencing big data decision-making capability. Some insightful data was gathered from the participants that were referred to the researcher by previous participants that the researcher would not have had access to if only purposive sampling had been used.

4.6. Sample size

As this was a qualitative study, the sample was small; although initially determining the sample size required to reach the saturation point of information was difficult to estimate, the researcher had set a target of 14 interviews. This number of interviews was also similar to what is suggested as ideal by Guest, Bunce, and Johnson (2006). Hsieh and Shannon (2005) advised that the coding of the interview transcripts and the identification themes should be done as soon as possible to determine saturation, but during data gathering, the researcher decided to conduct all 14 interviews before starting the analysis. The reason for this decision was that the researcher did not have sufficient time to do the transcription of the interviews and the analysis before the next interview was scheduled. The interviews were already arranged with set time slots allocated. Analysis was thus only done after all 14 interviews had been transcribed by the researcher. Figure 2 provides a breakdown of the unique codes that were generated per interview when performing the analysis after interview 14 had been completed. Saturation was reached after interview 12; in other words, no new themes were

identified after that interview (Guest et al., 2006). During the analysis of the first five interviews, 74 per cent of the total unique codes were generated.

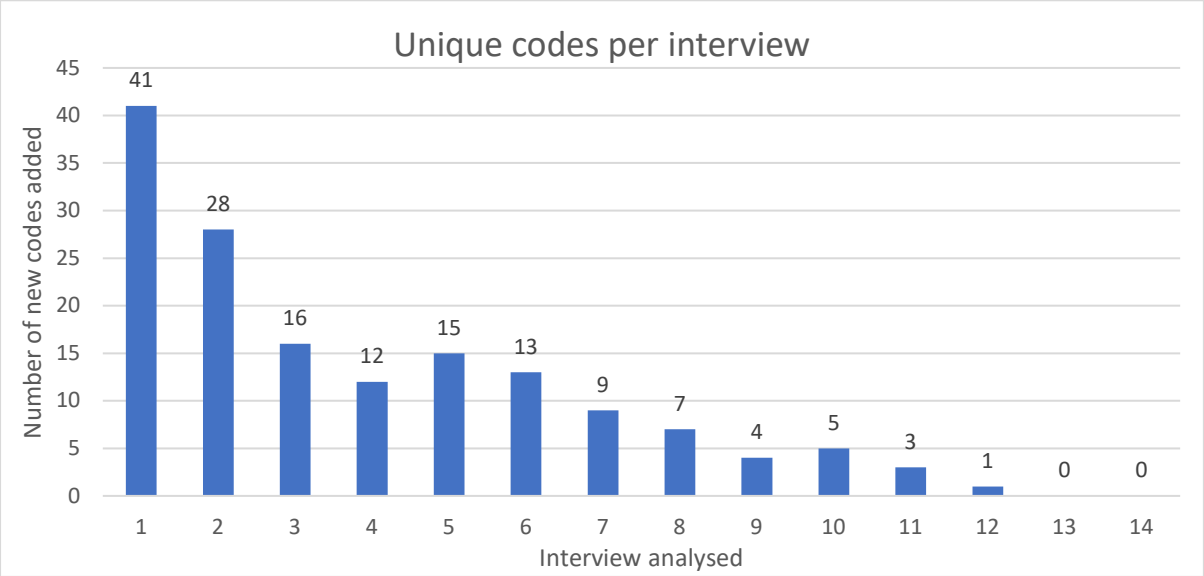

Figure 2: Breakdown of unique codes generated by interview

4.7. Measurement instrument

Saunders and Lewis (2018) recommend semi-structured interviews for exploratory research. The semi-structured interviews and the researcher were both measurement instruments for this research (Maxwell, 2013). The semi-structured interviews were a measurement instrument because they were used to gain an understanding of how the leadership style of the specific leader that was interviewed could enhance big data decision making capability. The researcher was also a measurement instrument because he could sense any additional information during the interview, and recall the information later when analysing the interview (Maxwell, 2013).

The COVID-19 pandemic regulations restricted travelling and face-to-face interactions thus, online interviews were conducted using the Microsoft Teams platform. All interviews were conducted using the same platform, and the infrastructure on the researcher's side of the online meeting was the same for all 14 interviews. When the internet connectivity allowed for it, the video function was enabled during the interview. The video function was only disabled during interview number 13 due to a connectivity limitation. Each of these interviews lasted for 34 to 52 minutes. The one interview that continued for only 34 minutes was the result of a

scheduling conflict with the executive leader, who changed the duration of the meeting to only 30 minutes shortly before the interview, however, it was agreed to still conduct the interview in the shorter period rather than postponing it. His schedule did not have an available slot soon enough to fit in with the time frame of this research project. The remainder of the interviews were all longer than 45 minutes. The literature review informed the interview guide that consisted of topics to be covered and questions to be asked. The interview guide is provided in appendix B. Preparation was thus an essential part of ensuring the content validity of the interview (Saunders & Lewis, 2018).

Before the first interview, two pilot interviews were conducted to check that the questions were clear and would be understood by the participants. These pilot interviews were conducted with leaders that were similar to the executive and senior managers that were the targeted participants for this research (Saunders & Lewis, 2018). Fellow MBA students that were interested in the data-driven decision-making field were selected for the pilot interviews. During these pilot interviews, attention was given to ensuring that questions were not leading to any preconceived idea, and that the answers would result in obtaining the required data (Saunders & Lewis, 2018). The researcher's body language and gestures were planned and evaluated during the pilot interviews to ensure that interest in the conversation was indicated to the participants. The Microsoft Teams platform and steps required to use the platform were also tested during the pilot interviews. The infrastructure used to record the online interviews were also tested during the pilot interviews and it worked correctly. It was essential that the participant felt comfortable, and that there were no disruptions during the interview. Additional preparation for the interviews included that the researcher made sure that he was well informed about the participant and the organisation. The researcher made sure his clothing and appearance were appropriate to the situation (Saunders & Lewis, 2018). The correct protocol regarding interviews had been observed. A consent form had been prepared and approved before the interviews were conducted. Consent to record the meeting was included as part of the consent form. Each participant electronically signed a consent form before the interview.

4.8. Data gathering process

An interviewer's skills may have a detrimental effect on the qualitative investigation (Agee, 2009),thus the interviewer needs to make sure his or her level of interviewing skills is developed adequately. This researcher watched several training videos to improve his interviewing skills. During the interviews, the formal introductions were conducted first after, which the participant was thanked for attending. The purpose of the research and interview

were explained. Emphasis was placed on the fact that the participant's own opinion was important. Additionally, the participant was encouraged to participate freely and openly to enhance the exploratory nature of the research. The interview guide with topics and questions guided the rest of the interview. During the interviews, the researcher strived to identify new themes and insights from the conversation and directed the conversation to obtain as much detail as possible. The interview continued until no new insights were provided, and the participant was then encouraged to provide any final thoughts (Saunders & Lewis, 2018). The participant was thanked for participation, and the interview was ended. The word processing and transcribing of the recordings were done as soon as possible after the interview. A list of the interview participants with their organisation descriptions and relevant positions are provided in Table 3 in the next chapter.

Unfortunately, there was a technical problem with the audio recording of the interview with participant one. The recording of the interview did not include the participant's audio feed and only the video and the audio of the researcher were recorded. This still happened despite all the testing and verification that had been done during the pilot interviews. Due to this problem all the aspects of this particular interview that the researcher could remember, were documented, supported by the notes taken during the interview, and used as record of the interview and for the analysis. Due to this problem and subsequent limited data from the interview, the interview was analysed last after all the other interviews. All the other interviews had been recorded correctly, without technical problems.

4.9. Analysis approach

In support of the exploratory nature of the research design, the researcher used a conventional approach to analyse the data gathered during the interviews. During this approach "analysis, coding categories are derived directly from the text data" (Hsieh & Shannon, 2005, p. 1227).

The interview recordings were transcribed and checked. The interviews were then rearranged in terms of the validity of the interview according to the researcher's opinion. The interviews that the researcher felt were more aligned with the content of the research topic were analysed first and the less relevant interviews were done last. An analysis sequence number was added as a prefix to the file name, so that the file name contains the analysis sequence number and the interview sequence number. This rearranging of the interviews according to apparent validity was done to enhance the assignment of codes during the coding process. The higher number of new unique codes were assigned during the beginning of the analysis and because the validity of the interviews declined, the number of new unique codes also tapered off to the end. It also helped with the analysis in ATLAS.ti because the more relevant codes were listed

at the top of the windows with quotes for that code. This listing at the top of the window was due to the category group numbers that was prefixed to the code text as explained in the next paragraph. The guidelines and suggestion from Hwang (2008) were used to assist the researcher in analysing the data to ATLAS.ti. During analysis, the researcher first did a high level reading through the data to identify concepts related to the research questions and aspects identified during the literature review (Bloomberg & Volpe, 2019). Codes were generated for these identified concepts and the quotes from the leaders interviewed were then linked to these codes. Consequently, the first few codes were influenced by the literature review but after that the codes were generated from the content of the interview. The researcher was flexible and added new codes when they emerged, not forcing data into codes already identified (Bloomberg & Volpe, 2019). Codes already created also needed to be refined as new insights were gathered from the data that corresponded closely to already created codes. Merriam and Tisdell (2015) emphasised that this creation and refining process of the codes is what data analysis is all about.

At the start of the analysis process, category groups were created to organise the codes. This was done so that the researcher did not have to read through all the codes to find an already existing code. Each category group was assigned a number and this number was prefixed to the code with a sequence number in that specific category group. The category groups created are provided in Table 2. As an example, when the fifth code was created for category group two, the code was prefixed with a two and a five and the code that was added to ATLAS.ti through the 'open-coding' function was '2-05-{Code Text}'. This was managed in a separate excel spreadsheet with a data filter on the column to enable quick text searching if required. After the analysis of the fifth interview, there were more than 100 codes, and these category groups contributed to the process of finding the codes more efficiently. It needs to be noted that these category groups were not the themes, they were only created to organise the codes. Later in the analysis process, when the themes were identified, the numbers of these category groups were scattered throughout the themes. See appendix C for a full list of the 154 codes that were created.

Table 2: Category groups for organising the codes

Initial code grouping number and description	
0	BD Definition & Characteristics
1	RQ1-Transformational Leadership
2	RQ2-Transactional leadership
3	RQ3-Leadership self-identities
4	RQ4-Contextual leadership and other leadership skills
5	Methods

When coding was completed themes were created. These themes are called code groups in ATLAS.ti and should not be confused with the category groups in Table 2 that was only used to organise the codes. The themes were created based on the understanding and interpreting of the leaders opinions expressed in the interviews. Themes were aligned with the research questions and the additional insights that did not fit in with a research question were grouped together into themes that could be useful for future research. These additional themes are shown in appendix C, but not discussed in chapter 5. No codes were placed into more than one theme (code group). The subheadings of the results chapter were also aligned with the themes. The first column of Table 4, in appendix C, indicates the subheading number in the results chapter and the themes are listed in the second column, with the codes in the third column. The fourth column is the number quotes that the code was linked to, and the last column is the number of network links that the code was involved in. By using this method, the results chapter and the specific quotes in the interviews can be easily traced by using ATLAS.ti.

4.10. Quality controls

4.10.1 Trustworthiness

Cassell and Symon (2011) noted that the trustworthiness of the findings in a qualitative research report is an essential aspect of the quality of the research. They define trustworthiness as "credibility, transferability, dependability, and confirmability" (Cassell & Symon, 2011, p. 635). Trustworthiness, that depends on the reliability and validity of the analysis and findings (Stiles, 1993), has been improved by keeping an audit trail of the coding and categorisation process (Cassell & Symon, 2011). Reliability refers to how much the observations can be trusted, and validity addresses the extent to which the interpretations or conclusions can be trusted (Stiles, 1993). The research strategy design was the main quality control instrument to enhance trustworthiness, and consequently, the research strategy was designed to enhance validity and reliability. Morse, Barrett, Mayan, Olson, and Spiers (2002) emphasised that these quality control procedures, standards and criteria needed to be implemented from early on in the research process. When control procedures, standards and criteria are only thought of at the end of the process, it cannot redirect or influence the research and will not improve the reliability and validity (Morse et al., 2002). Thus attention to the reliability and validity was given from the design of the interview guide and carried forward into the interviews and the analysis. Software backups were made of the ATLAS.ti software and excel sheets used to do the coding after every interview was analysed and later when themes were developed. Each of these software backups was given a unique file name that included

the date and time in the file name, and this helped with the audit trail of the process. These incremental backups of the excel sheet used to do the coding recorded proof of when every unique code was created for the first time.

4.10.2 Validity and reliability

Saunders and Lewis (2018) summarise validity as the test of "whether the findings are really about what they appear to be about" (p.134). Saunders and Lewis (2018) also identified principle factors that can compromise validity; these include subject selection, history, testing, morality and ambiguity about causal direction. These factors were closely monitored and controlled during the research process. Examples of precautions taken to prevent such compromising factors are that the researcher strove not to be affected by bias when selecting the participants for the interviews and that he did not try to impress the participant during the interview (Saunders & Lewis, 2018).

Reliability is the "extent to which data collection methods and analysis will produce consistent findings" (Saunders & Lewis, 2018, p. 135). The principal factors that can be detrimental to the research have been identified by Saunders and Lewis (2018) as subject error, subject bias, observer error and observer bias. These factors were controlled by focusing on the interview and coding process. During the interview, the participant was comfortable with the interview process and encouraged to think about the questions; this was done to minimise subject error and subject bias. The coding process was systematic and auditable. The researcher has ensured that there was an audit trail of the whole process to support the quality of the research. Special attention was also paid to consistency and accuracy by reflecting on every aspect of the research. Qualitative research can be subjective by nature and can be affected by the researcher being biased (Saunders & Lewis, 2018; Zikmund et al., 2013). For this reason, the interview questions were checked for any aspects of bias during the design of the interview guide and pilot interviews. Interview questions were also standardised to ensure that there was no bias between different interviews. During the interview, the participants were encouraged to explore the topic and were not led by the preconceived ideas of the researcher.

4.10.3 Credibility

To determine credibility, the researcher was used as a lens, and he brought personal biases to the data collection and coding process (Bloomberg & Volpe, 2019). During the interviews and the coding process, the researcher could have been biased toward specific experiences in the industrial sector and other engineering-related disciplines. Please see 4.11.1 for the limitations due to this aspect. To control this bias, the researcher did practise self-reflection

and disclosed any perspectives and beliefs that could have caused any lack of credibility to the research findings (Creswell & Miller, 2000). During the interviews and coding process, the researcher did not steer the conversation or coding away from any evidence that differed from his view or the trend that has been observed through the interview. The researcher thus took all the perspectives into account during the data gathering and coding process (Bloomberg & Volpe, 2019).

4.10.4 Dependability

Evidence on the processes followed during the data gathering, and analysis was given in the sections above. This evidence illustrates the systematic procedures that were followed to keep the circumstances of all the interviews similar and enhance the traceability of the coding process. The audit trail that has been kept through all the steps of the research does demonstrate the rigour of the process (Creswell & Miller, 2000).

4.10.5 Transferability

Transferability has been defined as “the degree to which findings can be applied to other settings, contexts, or populations” (Bowen, 2010). The transferability of qualitative research can be improved by using “thick descriptions” (Bowen, 2010, p. 867). Thick descriptions require the wording that is used in the results chapter to record the detail, context, emotions and other aspects that might be important to the point that a participant was making during the interview (Bloomberg & Volpe, 2019; Bowen, 2010; Creswell & Miller, 2000). To improve transferability, the researcher included descriptions of emotions and other context when quoting participants in the results chapter. By doing this, the researcher aimed to maintain the richness of the interview data. With the increased transferability, the reader can associate familiar circumstances with the context given when the results from the interviews were presented.

4.11. Research limitations

The research methodology does result in causing limitations and these will be discussed in detail below.

4.11.1 Researcher bias

The exploratory nature of qualitative research does present the potential that the identity, values and beliefs of the researcher could influence the research outcomes (Denscombe, 2014). When the research was conducted the researcher was working as an engineer in the

mining sector. The researcher was also extensively involved in industrial control systems with large volumes of structured data that had the potencial to enhance data-driven decisions. The researcher could have been biased towards the industrial sector during literature review, data gathering and analysis processes. The researched did control this bias by methods mentioned above; however, Silverman (2011) posits that it is prefered that the researcher is a group member of the sample because it will be possible to gain more insight. It is still important that the researcher acknowledges this as a limitation because it could affect the interpretation of the results and the outcomes (Saunders & Lewis, 2018).

4.11.2 Researcher's interviewing skills

The researcher did the interviews himself and has not been expertly trained on interviewing skills, and this could have had an impact on the results observed during analysis of the collected data (Agee, 2009). Although the researcher prepared for the interviews by educating himself through training videos on conducting interviews, and his skill improved as more interviews were conducted, this could have had a detrimental effect on the research outcomes.

4.11.3 Participant bias

Participants could have been influenced during the interviews by the title of the research, thus trying to talk about leadership styles when they had not thoughroughly considered it before. This would have resulted in unreliable data and could have affected the trustworthyness and credibility of the research outcomes (Saunders & Lewis, 2018).

4.11.4 Sampling bias

Only a limited number of individuals in the Mpumalanga and Gauteng areas of South Africa were interviewed. There was no attempt to widen the research to explore other countries and more industries. Generalisability to all countries will thus not be possible.
The purposive and snowball sampling techniques used could have had a limiting affect on the sectors that were sampled. Although the researcher tried to get participants from several different sectors, there might have been specific sectors that were not included. Generalisability to all sectors will therefore also not be possible.

5. Results

5.1. Introduction

In this chapter, the results of the semi-structured interviews are presented. An overview of the sample will be discussed first, then the executive leaders' views on big data are discussed, after which the results are organised to correspond to the research questions presented in chapter 3. The participants' views of big data were included to give context to the feedback and support the discussion in the next chapter. For every identified theme, a figure will be presented that illustrates the association between the applicable codes used for the specific theme. During the discussion of the themes, the code numbers will be given after the applicable sentence to help the reader reference back to the figure with the code network. The convention behind the code numbering has been detailed in section 4.9.

5.2. Sample Overview

The sample consisted of 14 participants from large corporate organisations and SMEs as detailed in section 4.3. All participants had previous exposure to big data and data-driven decision-making strategies. The participants were assured that the interview would be confidential thus, Table 3 provides a list of the 14 participants with participant identification removed. The industries represented and positions of the participants will be discussed in detail, and then important detail on the participants will also be discussed.

5.2.1 Industries represented in the sample

Participants were not from a specific industry. Half of the participants represented consultancy organisations that are involved in more than one industry. These consultants were involved in industries that include Financial Services, Telecommunication, Energy, Public Services, Consumer Product and Retail, and Mining and Metals. When analysing the distribution of participants per industry, only the main industry that the consultants were involved in were selected. Figure 3 below illustrates the distribution of the five main industries that were identified. These industries are Consumer Product and Retail, Financial Services, Telecommunication, Mining, and Oil and Gas.

5.2.2 Seniority of leaders in sample

The participants were all in an executive decision-making position as set out in the requirements specified in chapter 4. When analysing the distribution of seniority, the leaders were grouped into three categories. This grouping of the leaders was based on additional insights gained about the participants and their organisations while preparing for the

interviews. The first group was “CEO/SVP” and leaders in a CEO or Senior Vice-President position were placed in this group. This first group therefore included the most senior position in the specific organisation. The second group was “MD/GM/VP” and participants held the position of a Vice-President, Executive leader, Managing Director or General Manager. The third group was “Senior Manager” and participants held the position of Chief Analytics Officer, Chief Customer Experience Officer, or Digital and Data Lead. Figure 4 below illustrates the distribution of seniority based on this grouping.

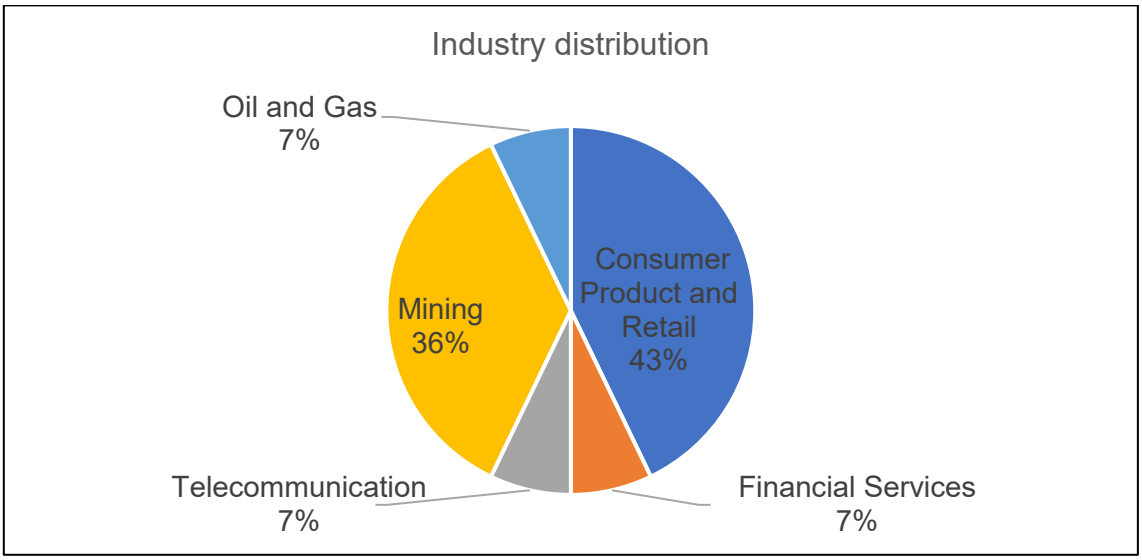

Figure 3: Distribution of participants per industry

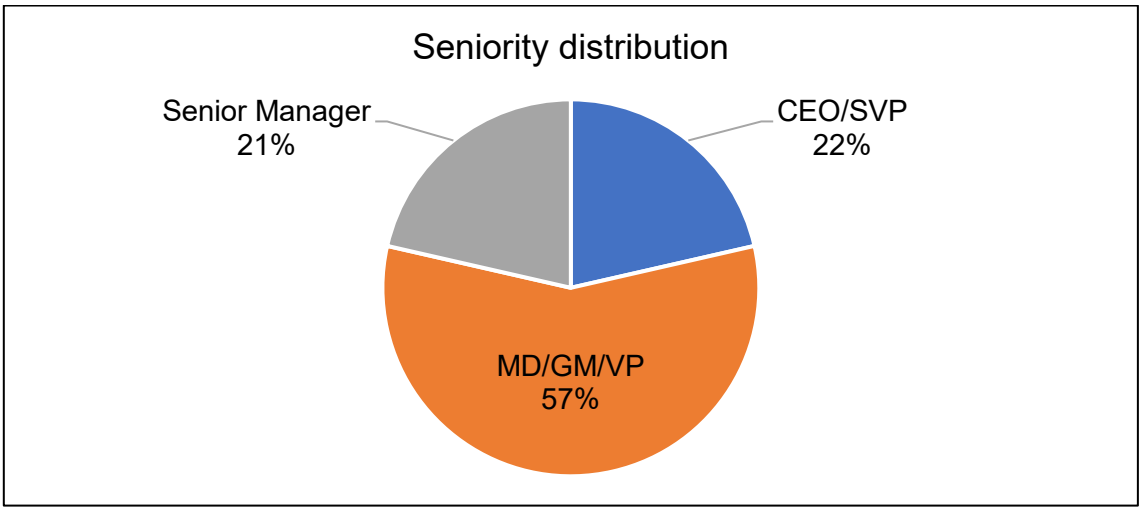

Figure 4: Distribution of seniority of leaders in sample

5.2.3 Important detail on participants

Although all the leaders interviewed had exposure to big data concepts, there were some that should be mentioned separately to elucidate the richness of the sample. Participants 3 and 5 are in consultancy agencies that specialise in utilising big data technologies to improve customer experience of the clients in the commercial sector. Their feedback on how leadership can improve big data decision-making capability was informed by extensive experience in both leadership and the use of big data to gain a competitive advantage. Participant 12 has a Doctorate (PhD) in mathematical statistics and probability, and he is utilising his deep understanding of big data to help the financial industry he is in to gain benefit from big data. Participant 10 spoke as a panel member at a business conference regarding the future of artificial intelligence and has extensive knowledge of how big data can enhance decision-making capability.

At the moment the mining industry is experiencing challenges in gaining benefit from big data (Qi, 2020). The participants from the mining industry are all involved in high priority digital strategies to use big data to improve the utilisation thereof in their mines or plants. Their view on utilising big data and the insight gained from the successes they had were helpful when the influence of leadership style on big data decision making capability was explored.

Table 3: List of participants with detail on the industry, organisation descriptions, positions, and gender

Participant Number	Analysis Number	Industry	Position	Organisation Description	Gender
1	14	Mining	Vice–President of Engineering	Underground mining company	Male
2	3	Consultancy – Financial Services, Energy, Consumer Product and Retail	CEO	Global consultancy assisting with digital decision support platforms	Male
3	1	Consultancy – Financial Services, Telecommunication, Consumer Product and Retail	Vice–President	A global consultancy that enhances the customer journey through the use of big data technologies	Male
4	11	Mining	Senior Vice–President	Underground mining company	Male
5	6	Consultancy – Financial Services, Consumer Product and Retail	CEO	Consultancy firm specialising in digital solutions that uses big data	Male
6	8	Consultancy – Financial Services, Energy, Consumer Product and Retail	Chief Customer Experience Officer	Consultancy firm specialising in digital solutions	Male
7	5	Consultancy – Financial Services, Telecommunication, Energy, Public Services, Consumer Product and Retail, and Mining and Metals	Managing Director–Data head	Global management consultancy specialising in large corporate organisation	Female
8	12	Consultancy – Mining	General Manager	Consultancy assisting with industrial data-driven solutions	Male
9	10	Oil and gas	Vice–President of Technical Support Process	Chemicals industry and mining company	Female
10	2	Consultancy – Financial Services, Telecommunication, Energy, Public Services, Consumer Product and Retail, and Mining and Metals	Executive leader	Global management consultancy specialising in large corporate organisation	Male
11	9	Telecommunication	Digital and Data lead	Telecommunication company	Male
12	7	Financial Services	Chief Analytics Officer	Commercial and business bank	Male
13	4	Mining	Executive leader	Opencast mining company	Male
14	13	Mining	Vice–President of Infrastructure	Underground mining company	Male

5.3. Executive leaders' view on big data

The view of big data, according to the leaders that were interviewed, can be grouped into three aspects: definition, characteristics and considerations for businesses.

5.3.1 Big data definition from the perspective of executive leaders

The codes generated during the analysis of the interviews that summarise the definition of big data from executive leaders' perspective can be seen in Figure 5, along with the associations that create a network between the codes. The business intelligence (BI) in code 0-02 and 0-09 refer to data from enterprise resource planning (ERP) or other similar business planning software packages. The machine data referred to in these two codes has its origin in the industrial industries where systems record large amounts of sensor data from machinery and use that for controlling the machine, planning maintenance schedules and predict component failures.

Five of the leaders defined big data as large volumes of structured and unstructured data from various sources, external and internal to their company (Code 0-06). Although four of the participants agreed that big data is more than business intelligence (BI) and other machine data (Code 0-02), two leaders regarded their BI and other machine data as big data (Code 0-09). Supporting the view that big data is more than BI and other machine data, a leader that is experienced in big data decision making, mentioned that BI was the new concept that everybody talked about in the early 2000s, but it has moved on to be much more. He commented that,

> *"people are stuck in the business intelligence world of what they think big data is about". Participant 3.*

He then went on to explain how, now 20 years later, he uses algorithms on the big data to help his clients with decision making.

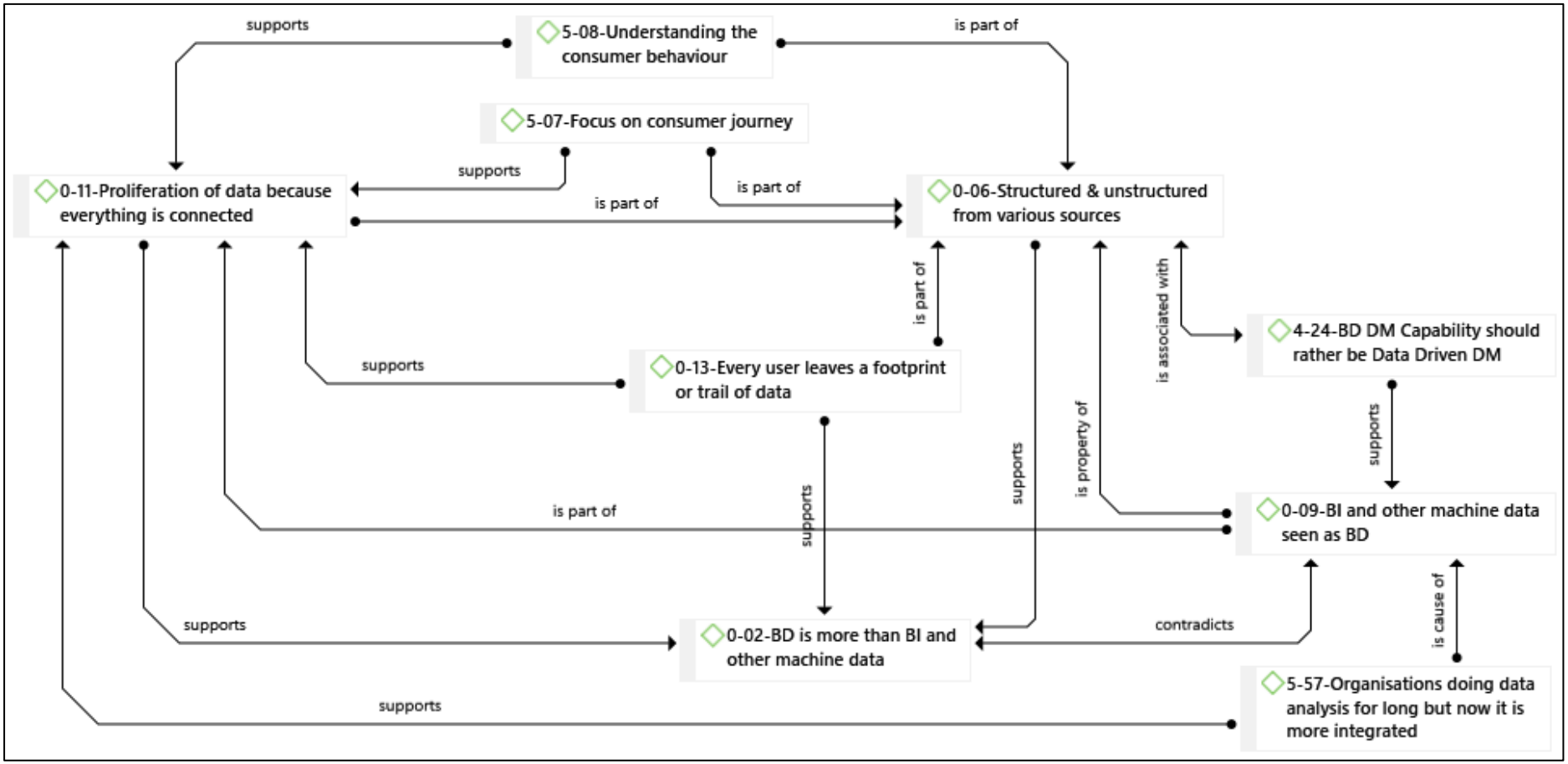

Figure 5: Codes for the executive leaders' view on big data

Another leader stated that many organisations do not really have big data but rather focus on data-driven decision making (Code 4-24). He added that to really utilise big data calls for a,

> *"whole new architecture to manage that data, a whole new different risk profile, a whole new security structure around big data, and you also can make a lot of great decisions from that". Participant 6.*

He reiterated that even if your decisions are not big data-driven, it will still be superior if you make data-driven decisions. He elaborated that,

> *"what you really may be looking for is, how does the company make more data-driven decisions, rather than just big data, because if it is big data, it really goes for a very small, I would not say a small subset of companies, but there are very few companies who actually have big data". Participant 6.*

He also added that machine learning thrives on large amounts of data, so leaders should not let the idea that your data is not 'big data' distract leaders from getting excited about the data. This view regarding machine learning was echoed by other leaders in the industrial industries where they gather data from processes and equipment to identify patterns and use this for prediction.

A leader from a large mining house was convinced that his BI and machine data constituted big data, and he elaborated on how they benefit from basing decisions on that data. Two of the leaders suported this view that BI and machine data are not significantly different from big data. The insights from these two leaders with the diferent view will be discussed in the next chapter. The other 12 leaders included BI and machine data into the definition, but explained that there is much more to big data than what is offered by only BI and machine data. This supports the view that BI and other machine data (Code 0-9) is seen as big data. The view that the question should rather be how leadership style enhances data-driven decision making rather than specifically adding the big data definition to the question (Code 4-24), supports the view that BI and machine data can be regarded as part of big data.

A leader of large management consultancy firm contributed to this discussion if BI and machine data should be included in the definition of big data when she said that,

> *"the generic description would be the proliferation of data because things are connected, be it people, be it devices, be it machinery." Participant 7.*

This proliferation of data has been assigned to code 0-11 and is involved in seven links to other codes, as can be seen in Figure 5. The same leader also added that,

> "the more and more of us are connected, and every time you are connected, you leave a footprint of data behind." *Participant 7.*

This view that every user leaves a data footprint (Code 0-13) was supported by one other leader. The other similar codes were the need to use big data to focus on both the consumer's journey (Code 5-07) and behaviour (Code 5-08). These views were supported by four and six other leaders, respectively.

When also commenting on the view that BI and machine data can be seen as big data (Code 0-09), the leader with a PhD in a data science related field, mentioned that organisations have had statisticians analysing data for many decades, but the difference is the data is now all connected, and leaders can base more business decisions on the data (Code 5-57).

The resultant definition of big data, as seen by the executive leaders, is that BI and machine data are included. They saw big data as the proliferation of data from various sources because everything is connected. Leaders agreed that decisions should be supported by data from a wide variety of sources that are informing the leader, either of client behaviour and needs or the status of their business processes and assets.

5.3.2 Special considerations needed for big data, as seen by executive leaders

The codes generated during the analysis of the interviews that summarises the special considerations needed for big data are reflected in Figure 6, along with the associations that created a network between the codes. These considerations were linked to how a leader creates a data chain that enhances big data decision-making capability. This data chain concept was part of the questions asked as detailed in the interview guide (Appendix B) and has been detailed in section 2.3 of the literature review.

Eight of the leaders felt that the field of big data is evolving fast, and that it is a challenge to coordinate all the aspects of big data (Code 0-01). One leader emphasised it by saying,

> *"typically the amount of data that is stored globally, and recorded globally doubles every second year. That is quite a scary thought if you think about it." Participant 3.*

One leader reflected on how the philosophy behind strategising asset management for the equipment that empowers big data decision making must be different, by saying,

> *"the pace of change is so fast, that if you were to buy it now and then spend the next three years trying to depreciate it, your competitors that are buying on a daily basis are constantly evolving and improving." Participant 2.*

Two other leaders also supported this by adding that storage was a problem in the past, but it is not the case anymore (Code 5-31). These leaders agreed that the expensive system

requirements that were a problem in the past are no longer a problem, but one needed to keep investing to stay competitive. It is thus not a once-off investment that is required, but rather a continuous journey to improve data-driven decisions (Code 5-11).

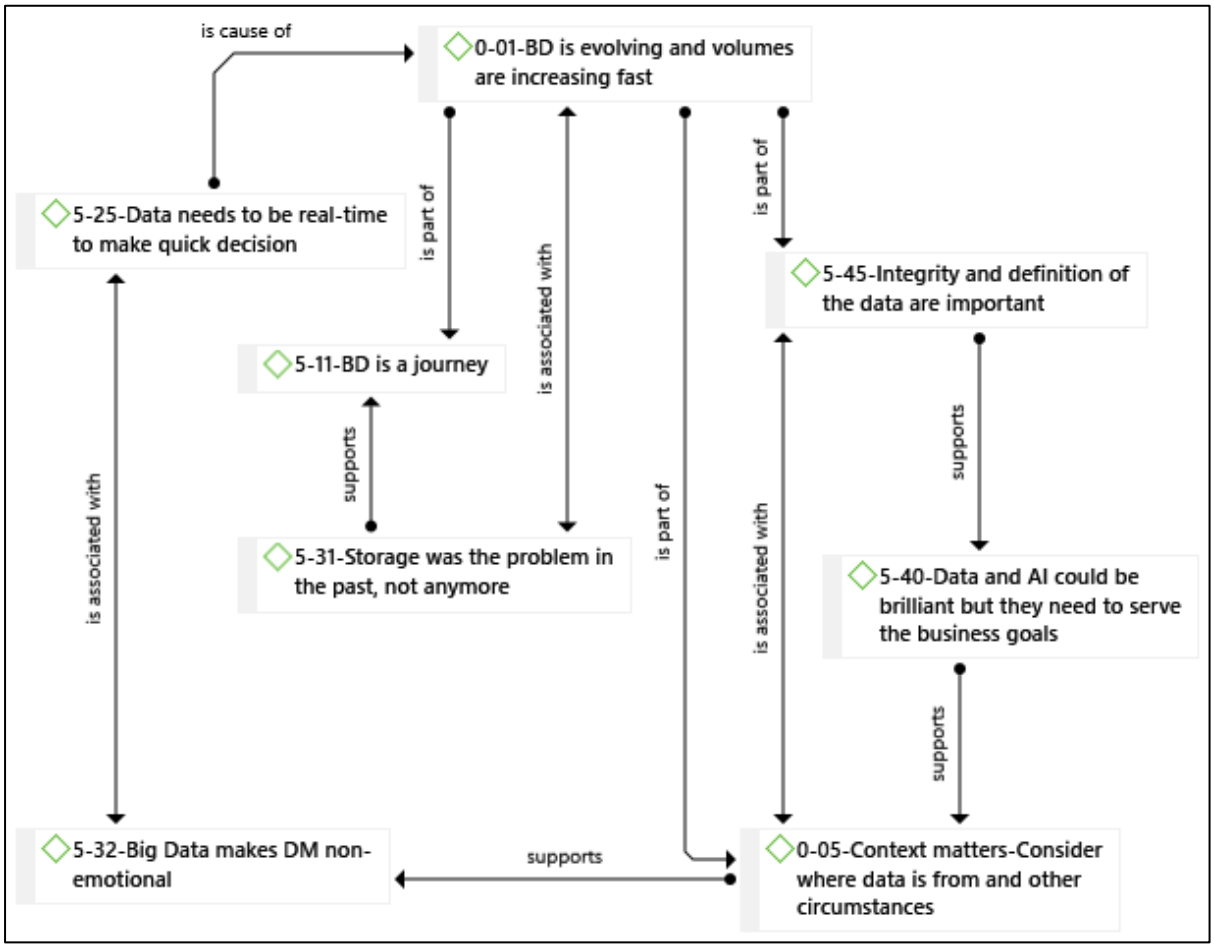

Figure 6: Codes for the special considerations needed for big data

The timeous availability of the data is important, and in this fast-paced world, data needs to be available in time to enable leaders to make data-driven decisions based on the most recent data (Code 5-25). This requires the leader,

"to start first of all working more on real-time data" Participant 5.

When discussing the old way of looking at historical data to make a customer decision, a leader commented that the decision would be

"too late, customers have changed by then." Participant 6.

The importance of the integrity of the data has been emphasised by five of the leaders (Code 5-45). They mentioned that if data was measured or processed wrongly, it could compromise the credibility of the data-driven decision. Data where the measurement definition was misunderstood can also compromise the quality of the decision, even if the analytics on the

data was perfect. Seven leaders supported a related view that data and artificial intelligence (AI) could be brilliant, but would mean nothing if it did not support the business goals (Code 5-40). Another leader supported the concept with comments that the context and circumstances of the data have to be considered as well (Code 0-05).

Another consideration of big data that was mentioned by the leaders is that it causes the decision-making process to be non-emotional (Code 5-32). A leader in a large telecommunication provider commented that,

> *"big data changes the mood also, so what I mean by that is, that big data is a non-emotional aspect of what you are doing. It is a very rational approach." Participant 11.*

Other leaders also mentioned that they see big data as making the approach more analytical; this view will be further discussed in section 5.7.2. As illustrated by the associations in Figure 6, the importance of context (Code 0-05), integrity and definition of the data (Code 5-45) and focusing on business goals (Code 5-40) all need to support a decision-making process that is less emotional (Code 5-32).

To summarise this theme, leaders felt there were many special considerations that were required for creating a data chain that enhances big data decision making capability and it should not be seen as a simple part of the organisation's strategy. Considerations that have been highlighted are the fast pace of evolution in the field and the need for the organisation to make it part of their journey to improved data-driven decisions.

5.3.3 Benefits from big data, and challenges to achieve the benefits

The codes associated with the benefits of using big data and challenges to achieve these benefits can be seen in Figure 7 below, along with the associations that create a network between the codes.

Ten of the leaders felt that businesses do not get all the benefit from big data or data-driven decision making, and there is room for significant improvement (Code 5-46). They either felt that the big data idea is misunderstood, that they do not know how to benefit from data, or that they have not yet spent enough time on it, or legacy systems prevented them from getting the benefit (Code 0-03). When a leader of a management consultancy firm was asked to comment if there are businesses in his industry that are successful at benefiting from big data decision making, his reply was,

> *"to be quite blunt, I have not seen many good examples." Participant 10.*

When considering some of his clients that were not digitally born, he commented that data,

"do not have that fundamental premise in their business. However, that does not mean that they can not derive value from a better understanding of data around whatever their problem is." Participant 10.

In this context, he defined non-digitally born companies as organisations that do not have big data strategies at the core of their business models. Two leaders were of the opinion that only some organisations are native big data users and others are not, but both could benefit (Code 0-08). Four other leaders confirmed that many different sectors could benefit from big data decision making (Code 0-07). Five leaders emphasised that using big data to make decisions was essential to stay competitive in their markets (Code 5-24). One leader gave an example and said data must be used,

"as a catalyst to drive improvement and to track progress and help people understand how we are doing against where we wanted to be and where we plan to be" Participant 2 (Code 5-37).

Another leader's view that is associated with this is that big data allows for more insights into and understanding of their business (Code 0-12). There are thus significant benefits for business in exploring and moving to big data and data-driven decision making. However, five of the leaders expressed the concern that it is not easy to use big data in decision making (Code 0-04) and then repeated the considerations discussed under the previous theme. Five leaders added that setting up your big data infrastructure requires large investments and the leader needs to be able to commit the necessary resources (Code 5-10).

Five of the leaders explicitly mentioned that the influence that leadership style has on data-driven decision making was a relevant topic and they were interested in how they could change their behaviour to enhance the quality of their decisions (Code 4-21).

As part of this theme, the leaders emphasised that there was room for improvement when it came to using big data for decisions, and many benefits could be identified. There were challenges listed to explain why their businesses did not get the potential benefit. The influence that leadership style can have to improve their big data decision making capability was confirmed to be a relevant topic.

In this introductory part of the interviews, the definition of big data was clarified, and special considerations specified, and potential benefits were listed with reasons why the leaders felt they did not benefit from those. The motivation behind adding this introductory part was to set the common understanding for discussing the leadership styles. The results from the discussions around the first leadership style, transformational leadership, will be detailed next.

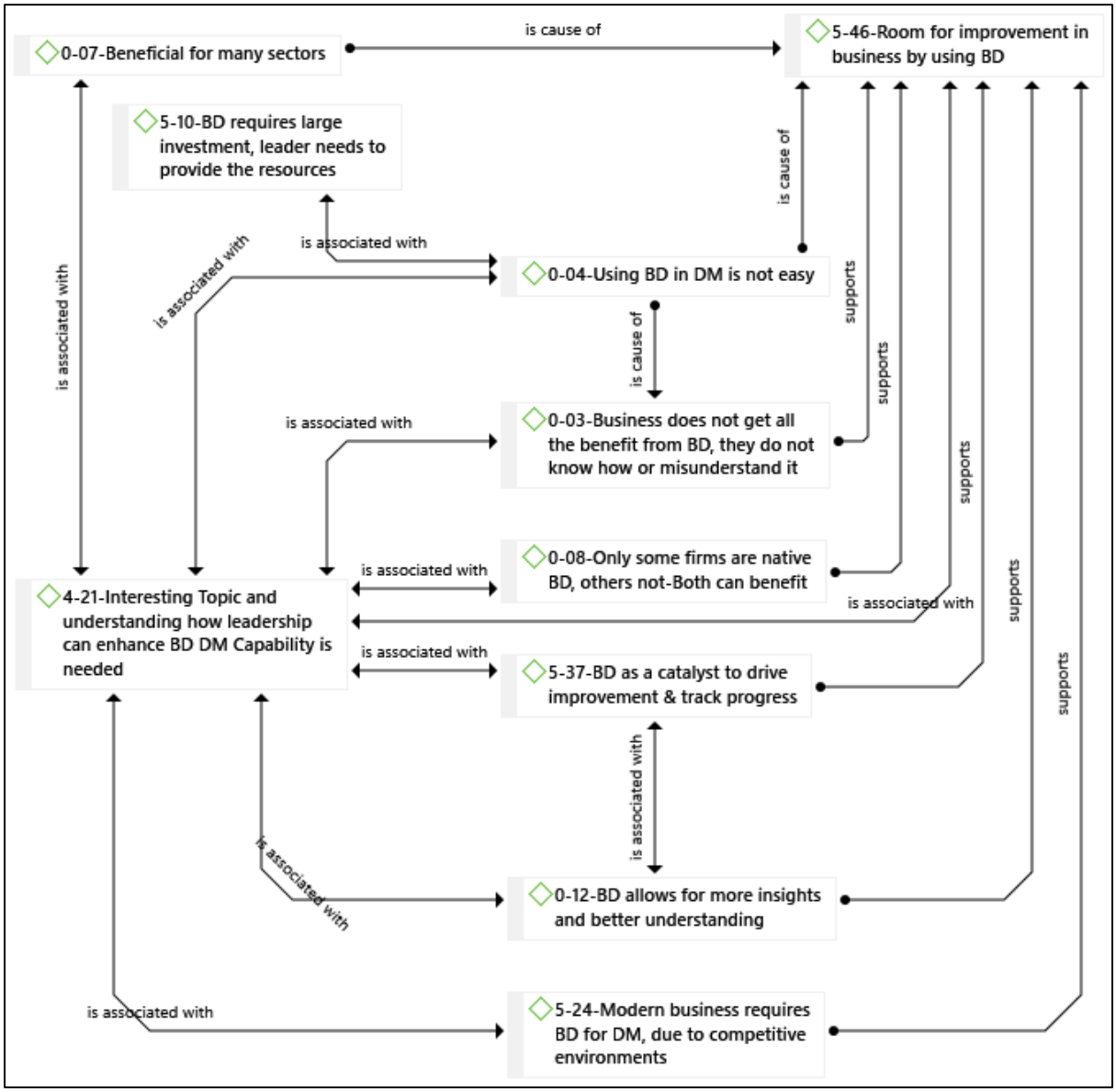

Figure 7: Codes for the benefits from using big data and challenges to achieve the benefits

5.4. Results of research question 1 – transformational leadership

The way the four dimensions of transformational leadership can help a leader to create a data chain that enhances the organisation's big data decision-making capability will be discussed under two themes that were identified: The first is to inspire the vision and unite the team to be data-driven, and the second is to be intellectually stimulating and have individualised consideration.

5.4.1 Transformational leader to inspire a vision and unite all to be data-driven

The first theme that was identified is that a transformational leadership style is required to inspire a vision and unite the team to be data-driven. The codes associated with this theme are reflected in Figure 8, along with the associations that create a network between the codes. The two dimensions of transformational leadership that were associated with this are charisma (Code 1-01) and inspirational motivation (Code 1-02). These original concepts from the literature review in chapter 2 are highlighted in the dark grey colour in Figure 8.

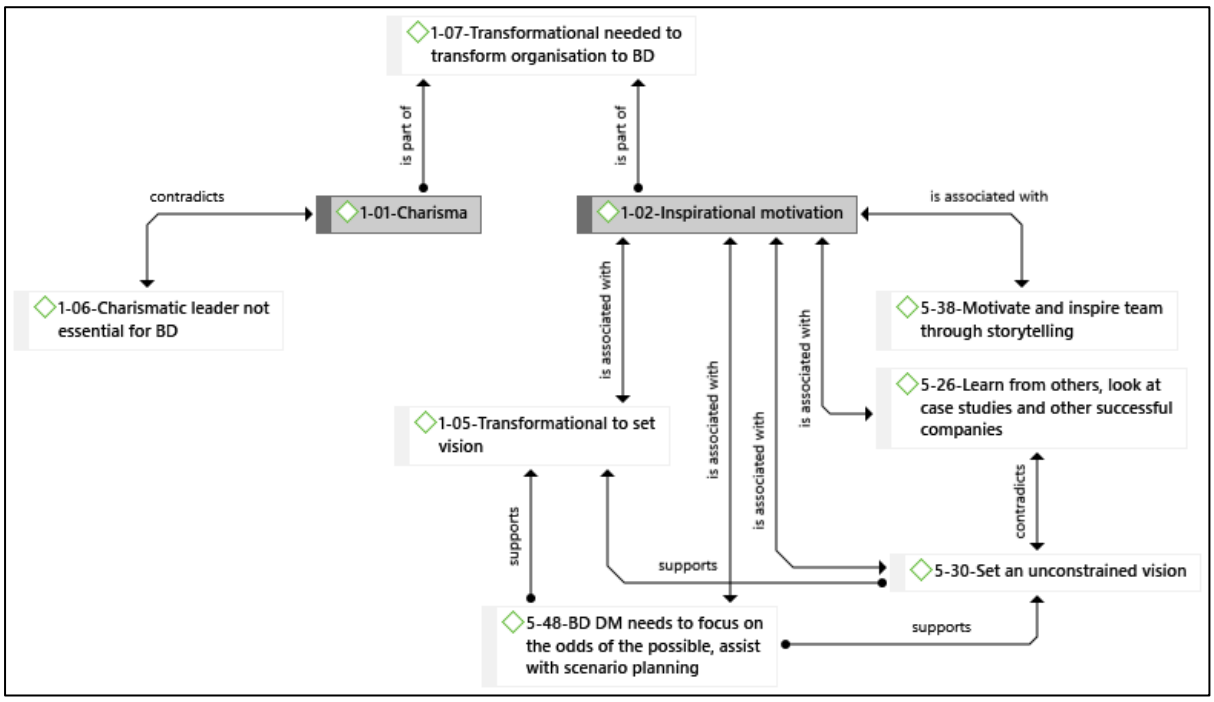

Figure 8: Codes for the need to inspire a vision and unite all to be data-driven

The first part of this theme was to inspire a vision by painting a picture of the future that is using big data to make decisions and to sketch the advantages that are envisioned (Code 1-05). Ten of the leaders supported the view that a transformational leader is required to set the vision (Code 1-05). The inspirational motivation dimension (Code 1-02) of transformational leadership has been associated with this ability to inspire followers. When discussing this inspirational motivation dimension, one leader indicated,

> *"that is an important part of the leader's job, the ability to tell us how our road map will look like and how we are doing. To be able to keep score and help us understand where we are and where we want to be." Participant 2.*

While still discussing the inspirational motivation dimension (Code 1-02), he elaborated that,

"really good leaders are able to figure out how to make the right message relevant to the right person to motivate people." Participant 2.

Another leader used Elon Musk, the CEO founder of Tesla, SpaceX, and other technology companies, as an example of a leader that inspires his team to achieve their vision. He emphasised that it starts with leaders challenging themselves with the desired vision and they,

"need to demonstrate it by inspiring people, challenging people, because the role of a leader is also to give challenges to people to say we need to fly to the moon." Participant 13.

A leader in a telecommunication company latched onto this need to inspire the vision and strategy to implement it, and said,

"no strategy is successful if your employees are not buying into it, and they do not agree with it. And I think this is where the inspirational and motivational leader comes in, by being able to communicate this to all levels and get buy-in to the strategy." Participant 6.

All 14 of the leaders supported the view that inspirational motivation was needed, especially at the start of the big data journey, to set the vision and unite the team (Code 1-02). An example of this is the statement that,

"in the beginning, when you are starting an initiative like this, you need someone inspirational, to drive it to see where you are." Participant 11.

Three leaders supported the view that an unconstrained view must be set (Code 5-30).The leaders emphasised that the vision must not be constrained by what is possible today, they supported the concept of 'dreaming big'. One leader explained it in this way,

"make sure that you augment, enhance, go wider and deeper because the capabilities and models and algorithms that are going to come out in the next two years … will open your eyes to what is possible and focus on putting that foundation in place." Participant 10.

This corresponded with the future goal orientation mentioned under inspirational motivation in the literature review done in chapter 2.

Inspirational motivation (Code 1-02) was also associated with learning from others by utilising case studies of successful big data initiatives in other organisations (Code 5-26). Three leaders supported the utilisation of case studies (Code 5-26). One leader encouraged this as

a motivation method but cautioned against allowing the case studies to constrain your vision (Code 5-30). He explained it by saying,

> *"do not constrain yourself in the vision with what you can foresee is possible today." Participant 10*

Therefore, the contradiction link was made between learning from others (Code 5-26) and setting an unconstrained vision (Code 5-30) in Figure 8.

Another motivation method supported by four leaders was the use of storytelling (Code 5-38). One leader explained it by saying,

> "once you communicate from an inspirational storytelling perspective, people get it, and you must become the storyteller, describe it in a simple way and then people get it, and that becomes the culture of that organization." *Participant 6.*

The inspirational motivation (Code 1-02) dimension was also highlighted when three leaders mentioned that big data could be used to motivate team members through scenario planning (Code 5-48). They argued that using the statistics behind big data to determine the probabilities of certain scenarios to play out is an ideal way the big data vision can be supported. When discussing how to set the vision, one leader commented that,

> *"the first thing you want people to understand is, what is the odds of the possible, you know, to move an organisation to being making decisions based on data is quite nebulous, people are not going to understand what you are talking about." Participant 7.*

She went on to explain that you set a practical vision and inspire the team by getting,

> *"them to understand it, see the odds of the possible and said, jeepers, check it that organisation in that continent, look at what they are able to do." Participant 7.*

This practically supported the view that a leader needs to set an unconstrained vision (Code 5-30).

The second part of the theme was to utilise transformational leadership to unite the team behind data-driven decision making. Charisma (Code 1-01), the first dimension of transformational leadership, was associated with uniting the team in being data-driven. While discussing this one leader made the connection by saying,

> *"I think it is really around that connection with people and appealing to their understanding of the role that they would play in helping the business achieve something by performing in a certain way making data available." Participant 7.*

This statement related to the 'idealised influence' aspect of the charisma dimension that was discussed in the literature review in chapter 2. Another leader supported charisma as being important because it will,

> "help you sell that vision to the broader exco because there are many competing issues." *Participant 10.*

In other words, the admirable way that a charismatic leader behaves will help to convince the rest of the executive committee to be more data-driven and prioritise this above other pressing matters on the agenda. This was supported by another leader who mentioned,

> *"the most successful people in any business are people with a charismatic slash influential leadership quality." Participant 6*

Six other leaders supported this notion of the ability to influence through a charismatic style (Code 1-01). When asked to give advice on being more data-driven, one leader answered,

> "there is always that inertia of, this is the way we have always done it and it has worked fine, why do you want to change that? So I think overcoming that inertia, certainly you need the charismatic ability to spark some excitement and positivity within the organisation for the shared goal of where we are headed, and what are we trying to achieve." *Participant 8.*

While discussing an ideal leadership style to enhance big data decision-making skills, one leader explained that she would focus on,

> *"the charm and the charisma and the common vision to say how could you get a greater quality decision?" Participant 7.*

Being charismatic was not seen as being essential in all circumstances (Code 1-06). Four leaders supported this contradicting view. One of these leaders commented that,

> *"I will be hesitant to say that the charisma or that style or approach of leadership is necessarily needed in every instance." Participant 2.*

He went on to explain that not all successful leaders were charismatic, and being inspirational was more important when you paint the picture of the future. Another leader supported this by saying she was,

> "not sure whether charisma is the most important." *Participant 9.*

She explained that a leader rather needs to set the vision and challenge the team members.

Three leaders made the connection that a transformational leader was needed to transform the organisation to utilise big data for decision making (Code 1-07). This was not associated with setting a vision, but it was mentioned when discussing the differences between transactional and transformational leadership. All three of the leaders preferred the transformational style to enhance the journey to use big data when making decisions.

The overall feedback, from the leaders who participated, was that they agreed that the inspirational motivation and charisma dimensions of transformational leadership were needed to paint the picture of a desirable future that is common between all the members of the team. As noted, some did mention that the charisma dimension was not the most important.

5.4.2 Transformational leader with intellectual stimulation and individualised consideration for a sustainable benefit

The next theme that was identified is that a transformational leadership style is required with elements of the intellectual stimulation and individualised consideration dimension to make sure the benefit is sustainable. The codes associated with this theme can be seen in Figure 9, along with the associations that create a network between the codes. The two dimensions from transformational leadership that were associated with this are intellectual stimulation (Code 1-03) and individualised consideration (Code 1-04). These original concepts from the literature review in chapter 2 were highlighted in a dark grey colour in Figure 9.

One leader referred to the intellectual stimulation dimension of transformational leadership when he reflected on the long-term stimulation of data scientists (Code 1-08), and he said that,

> *“often what excites them is the complexity of the problem.” Participant 2.*

Another leader supported the sustainability aspect by saying,

> *“if you are going to hire a proper scientist, the charismatic and the inspiration, and all of that fades away when they start seeing the real work.” Participant 5.*

He went on to say,

> *“the craft they do is by far the most important thing. And if you cannot keep those problems challenging, and give them fertile soil to grow in and learn from each other, and continuously practice the latest techniques, they get bored, and they are going to start looking somewhere else.” Participant 5.*

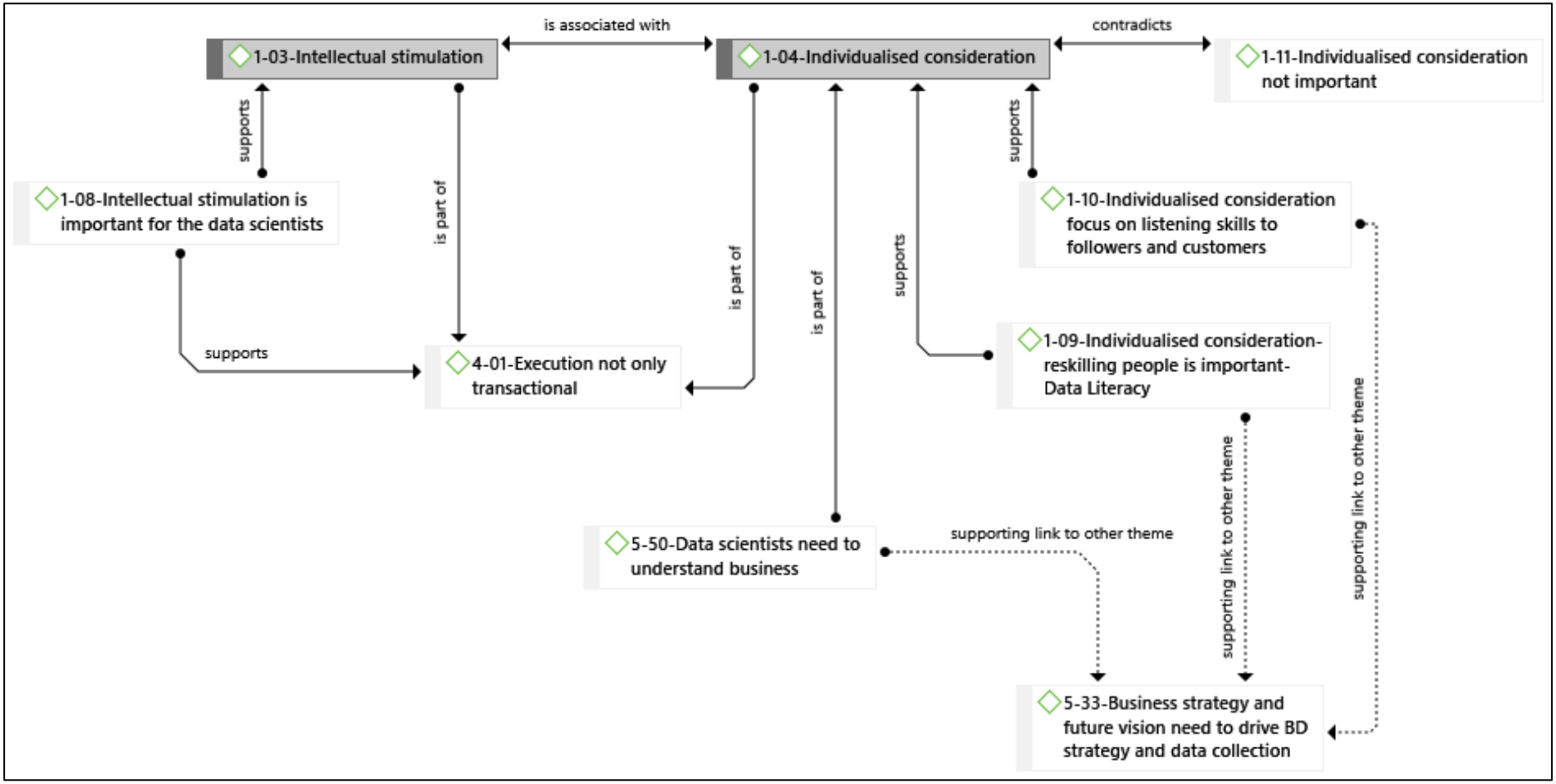

Figure 9: Codes for a transformational leader with intellectual stimulation and individualised consideration for a sustainable benefit

Another leader supported the intellectual stimulation dimension by stating that

> *"by continuously improving, it is about getting them to be excited on a day to day basis that they are doing something different." Participant 6.*

A different leader in the mining industry supported this by saying an important aspect was,

> *"intellectual stimulation and you have to get the right people around because when you start analysing data, you start processing it, and you start seeing trends, and you start using that people will be obviously quite excited about some of those things, and then they will obviously see, okay, now I get it, that this is why I need to do this." Participant 4.*

He went on to leaning to the individualised consideration dimension but still focusing on intellectual stimulation aspect by adding,

> *"you are leading by multiplying, by saying, let me get into your native genius. That native genius, I allow you to go and explore and come back to me and tell me what you have done." Participant 4.*

More leaders mentioned the individualised consideration dimension of transformational leadership (Code 1-04). Their feedback ranged from making sure individuals grow in their data-driven journey to ensuring team members do not burn-out. A leader made this connection by saying,

> *"and then once the intellectual part is done, you become more of a mentor." Participant 11.*

Someone else supported this by saying,

> *"I think it is really around that connection with people and appealing to their understanding of the role that they would play in helping the business achieve something, by performing in a certain way making data available." Participant 7.*

Using the individualised consideration dimension of transformational leadership to educate the team about data was another aspect that was clear from the leaders (Code 1-09). One leader stated it this way,

> *"transforming and re-skilling people, which also is a big issue and a big component of leadership, because you know, very well, not everyone was born today prepared for the data-driven world, and they have to acquire a bit of skill." Participant 12.*

He continued to say that data literacy was important in the whole team, and education was required to improve the level of data literacy. He emphasised that,

“data literacy must be capitalized on. It is a very big area. It's being discussed across the world now.” Participant 12.

Building on the need for individualised consideration through education (Code 1-09), one leader argued that it is important that a leader,

“recognize that people need specific skills to be able to do that. So it is then also to recognize that you need to train and educate your team so that they can meet that expectation.” Participant 9.

It was highlighted that education about the business is also essential for the data scientist team (Code 5-50), because as one leader mentioned,

“a lot of people I see have the idea of going out and getting a data scientist is just getting someone with a PhD in something who comes from academia. And that is very dangerous because those people do not understand business. You know, and it does not mean if you are a scientist, you are going to be good at business.” Participant 5.

This highlighted the need to make sure that the individualised consideration dimension of transformational leadership was used to ensure that all team members understand the business vision and strategy. This belief that the big data strategy and data collection strategy needed to be driven by the business strategy (Code 5-33) has been supported by all 14 of the leaders interviewed.

Another important aspect of individualised consideration highlighted by a leader is that it is important to,

“*listen to your followers or your employees. But at the same time, you need to listen to your customers.” Participant 6.*

This view that the individualised consideration dimension of transformational leadership is essential when focusing on followers and customers (Code 1-10) also supports the need that data strategy needs to be driven by business strategy (Code 5-33).

There was one leader who did not regard the individualised consideration as being very important when he compared it to the other three dimensions of transformational leadership (Code 1-11). This added an important perspective on how leaders see the dimensions of the leadership styles differently, and it will be discussed in the next chapter.

This feedback from the leaders that the use of the intellectual stimulation and individualised consideration dimension of transformational leadership to ensure the sustainability of the benefit does indicate that the execution of big data decision making is not only transactional

and transformational leadership can also be beneficial (Code 4-01). Two leaders supported the view that execution is not only transformational. They explained that during execution, it is important to have deliberate communication, collaboration, and inclusion of individual goals.

This theme of the intellectual stimulation and individualised consideration dimension of transformational leadership to ensure the sustainability has been seen to follow the inspiring a vision and unite the team in being data-driven. Both themes were important, and one was not prioritised above the other. It was also suggested that one theme could not be beneficial without the other.

The feedback on transactional leadership will be discussed next.

5.5. Results of research question 2 – transactional leadership

The way how the three dimensions of transactional leadership can help a leader create a data chain that enhances the organisation's big data decision-making capability will also be discussed in the two main areas that were observed. The first is to ensure strategic execution and the second will look at how the leader should have a balance between active and passive management by exception (MBE).

5.5.1 A transactional leader needed for strategic execution

The first theme related to transactional leadership indicates that a transactional leader is needed for strategic execution. The codes associated with this theme can be seen in Figure 10, along with the associations that create a network between the codes. The dimension from transactional leadership that was associated with this is contingent reward (Code 2-01). This original concept from the literature review in chapter 2 was highlighted in a dark grey colour in Figure 10.

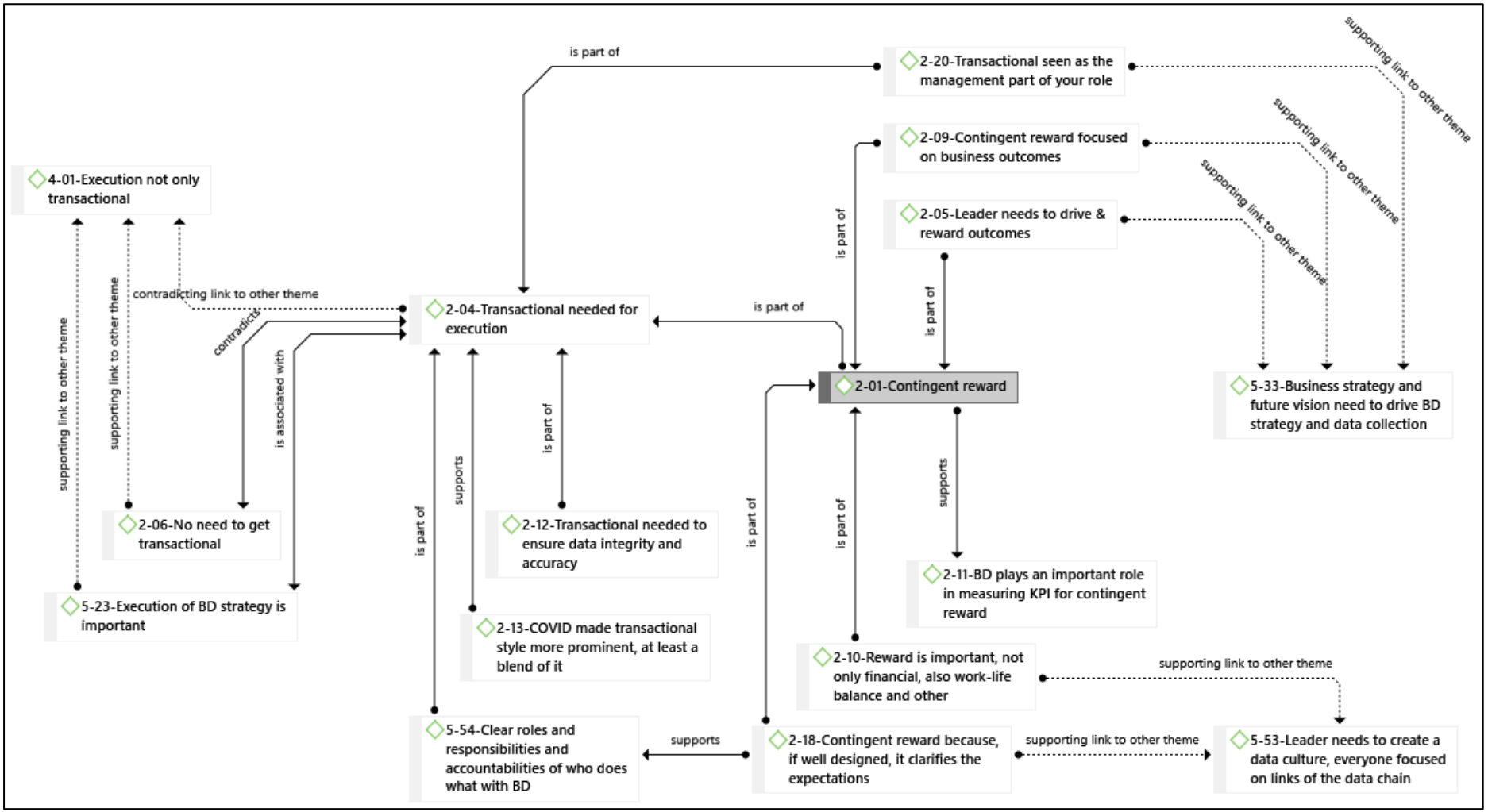

Figure 10: Codes for transactional leader needed for strategic execution

Eight leaders associated transactional leadership predominantly with the execution of their big data strategy (Code 2-04). When asked about the applicability of different leadership styles, a leader from a managing consultant agency emphasised that,

> *"when I now have to implement it, I would be a lot more comfortable with a transactional style." Participant 7.*

She backed this up by saying,

> *"transactional leadership has a place where it is particularly effective." Participant 7.*

and she explained that transformational leadership was needed for establishing the vision, but transactional leadership was required to get the work done. Another leader supported this by saying that the transformational style of leadership was sometimes not clear enough. He saw transactional leadership as more suitable for execution because,

> *"at the end of the day, we are running a business, and I think a lot of times, leaders need to articulate more clearly, what is the requirement." Participant 5.*

When asked about transactional leadership, one leader referred to a book by Gary Hamel and CK Prahalad called *Competing for the future*. He said,

> *"they say the difference between a mediocre strategy and a great strategy is all about execution." Participant 3.*

He continued to explain that,

> *"when you go to, you have an ok strategy versus a brilliant strategy, the difference is in the execution." Participant 3.*

The leaders associated with his view that the execution phase is important (Code 5-23) in transactional leadership (Code 2-04). This was also supported by another leader, saying

> *"transactional leadership is often about getting certain things done and it is about leading people to get the job done. Because we can talk strategy all we want, but you have got to get on to the job." Participant 2.*

One leader had an interesting argument about getting the job done and with all the online meetings and flexible work arrangements that were brought about by COVID-19. He said that,

> *"due to COVID, transactional style leadership is going to become a lot more popular." Participant 5.*

He carried on explaining that he can get anyone to do work for him from anywhere. To support this, he said

"I have made about 605 new hires, who have never met physically, all done online. They work for us. They're getting work done." Participant 5.

He argued that it would only be about the transaction between the organisation that wants the work done and the resource that can do the work; when the work is done, the transaction is completed and resource is flexible to work for someone else (Code 2-13). His company specialises in big data and assisting commercial companies in benefiting from knowing their customers better through using big data. Thus he tied this viewpoint back to all the data scientists he is working with, but it can be applied to other aspects of businesses as well. He supported this statement by saying,

"I think this idea of having more small pieces of work that allow anyone to do is really going to be quite an interesting play where transactional is going to be." Participant 5.

When discussing the need for different leadership style for different aspects of the big data journey, one leader pointed out that she,

"would definitely want a transactional approach when it comes to making sure that the data is accurate, that the decisions are accurate, so for the accuracy and the integrity of what is being done, your transactional style would be great." Participant 7.

As indicated in Figure 10, this view that transactional leadership is important to ensure data integrity (Code 2-12) has been regarded as part of the view that transactional leadership is needed for execution (Code 2-04).

Transactional leadership has also been associated with setting up clear roles and responsibilities for the big data journey (Code 5-54). These will control the transactions between the leader and the followers. A leader clarified it by saying it must be done,

"so that things can work together, and you have to have a way of having a handshake." *Participant 12.*

When looking at execution and the transactions between the leader and the follower, someone else mentioned that,

"in the transactional space, you got to set up systems, you got to find a way to set up your management infrastructure things where KPIs [key performance indicators] that track people are followed up and all of that." Participant 4.

This use of big data to measure performance (Code 2-11) has been supported by five leaders. This then linked with the contingent reward dimension of transactional leadership (Code 2-01). Contingent reward was seen to be part of the need to be more transactional when busy

with execution (Code 2-04). When thinking about contingent reward, a leader mentioned that he,

> *"actually does not think you can manage any environment without outcomes, the contingent reward type of thing." Participant 3.*

This need to use contingent reward to drive business outcomes (Code 2-09) was a common view from four of the leaders. A similar view that the leader must drive and reward outcomes through contingent rewards (Code 2-05) was also supported by three leaders. Although another similar view that can be associated with this is that the aspects of transactional leadership can be seen as being part of the manager facets of a leader's role (Code 2-20), only one leader supported this view. These three similar views have been grouped together in Figure 10. As with the previous theme, these three views also linked back to the requirement that business strategy and future vision needs to drive big data strategy and data collection (Code 5-33). When focusing on execution and the need to align contingent reward back to business goals (Code 2-09), one leader remarked that,

> *"I do believe that the power of the contingent reward that resonates for me is the clarifying of expectations because I do believe that it's important. The team needs to know what the ultimate goal is and what you expect them to deliver." Participant 9.*

Another leader supported contingent reward by explaining that if,

> *"I was able to reward them, I would say it is about partnering with the business to help solve (sic) a better business outcome or to help create, to be the catalyst to solve and understand a different business problem that the business has got." Participant 2.*

This view that the use of a well-designed contingent reward system clarifies expectations (Code 2-18) supports the previously discussed view that clear roles and responsibilities must be provided through transactional leadership (Code 5-54). One leader made it more specific to a data-driven strategy when he remarked,

> "so that is transactional, you reward specific data-driven initiatives that lead to success." *Participant 12.*

He added that by adjusting the reward, a culture would be formed around using data to inform decisions. Another leader also had this implementation of transactional leadership to influence the culture of using data in mind when he advised that a leader needs to,

> *"break it down into actionable steps that make it real, make it practical that people can see it, feel it, etc. And then bring in objectives very clearly related to how the organization uses data." Participant 7.*

This need for a leader to create a data culture (Code 5-53) will be discussed in section 5.7.2. When reflecting on these rewards another leader commented,

> *"it could be monetary or non-monetary, but you are dealing with people, to a machine you can say come tomorrow morning and the big data system will give you something. So you need to inspire and create a mechanism where the person feels how do you get to benefit from this, as I mentioned, monetary or not." Participant 11.*

This view that contingent reward is important in financial and non-financial form (Code 2-10) has been supported by five leaders. Work-life balance was also included in this view to consider various forms of contingent rewards. Two of the leaders also connected the use of applicable contingent reward to creating a data culture (Code 5-53). In order to encourage a data-driven culture, there was a strong recommendation that the KPIs of the organisation needs to be tied to proof that data-driven decisions have been made. These KPIs would then be linked to contingent reward. Note that this aligning of KPIs to be more data-driven is different from the need to use big data to measure KPIs (Code 2-11) mentioned earlier.

There were four comments indicating that transactional leadership is optimal for executive leaders (Code 2-06). One leader mentioned that there was a need to have transactional leaders in middle management to get the vision executed. She explained it by saying,

> *"I not sure that a transactional leadership style is best suited. It is perhaps suited for further down the line." Participant 7.*

The view that the execution phase is important (Code 5-23) was not only associated with transactional leadership (Code 2-04), but was also mentioned when transformational leadership was discussed (Code 4-01). This reference back to transformational leadership is indicated by the dotted line between Code 5-23 and 4-01 in Figure 10. Someone else mentioned that a transactional leader would not be able to lead the team to the big data vision and unite the team; she believed that it would not be beneficial for an executive leader to be transactional. Another leader agreed with the whole notion that there was no need to get transactional (Code 2-06) by stating,

> *"I do not see the need to get transactional. I think the danger that you are in on going into transactional leadership is to micromanage. And to pretty much then become the single point of failure in that process. I would rather that we empower, and we give our people room to fail within limits, and then rather understand what we can learn from those failures. I think that is a far more sustainable type of solution." Participant 10.*

The importance of transactional leadership in the execution of a big data strategy (Code 2-04) contradicts with the view in the previous theme that execution is not always transactional

(Code 4-01). The contradicting and supportive relationships to other themes have been marked by the dotted lines in Figure 10.

The importance of contingent reward in the orchestration of resources to create a data chain that enhances the organisation's big data decision-making capability was very prominent in the interviews with the leaders. MBE was also mentioned several times, and in the next section, the balance between active and passive MBE will be discussed.

5.5.2 A transactional leader must balance active and passive MBE

The second theme related to transactional leadership indicates that a transactional leader must balance active and passive management by exception (MBE). The codes associated with this theme can be seen in Figure 11, along with the associations that create a network between the codes. The two dimensions from transactional leadership associated with this are active MBE (Code 2-02) and passive MBE (Code 2-03). This original concept from the literature review in chapter 2 was highlighted in a dark grey colour in Figure 11.

When asking a leader about the effectiveness of active and passive MBE and deliberately sketching them to be very different, the leader had an insightful reply. He said,

> *"I think an executive leader's role is to allow his managers to manage. So, I do not think that the way that you put it, that taking a backseat and sitting on the podium is the right solution either. I think it is about getting involved, but the art is not to feel that you are disempowering your managers. And that involvement should be around ideation, helping to govern and take key decisions. More so than to roll up your sleeves and do the manager's job for them." Participant 10.*

This view that managers need to be allowed to manage while the executive leaders stay involved (Code 2-08) has also been supported by three other leaders when they were discussing active and passive MBE.

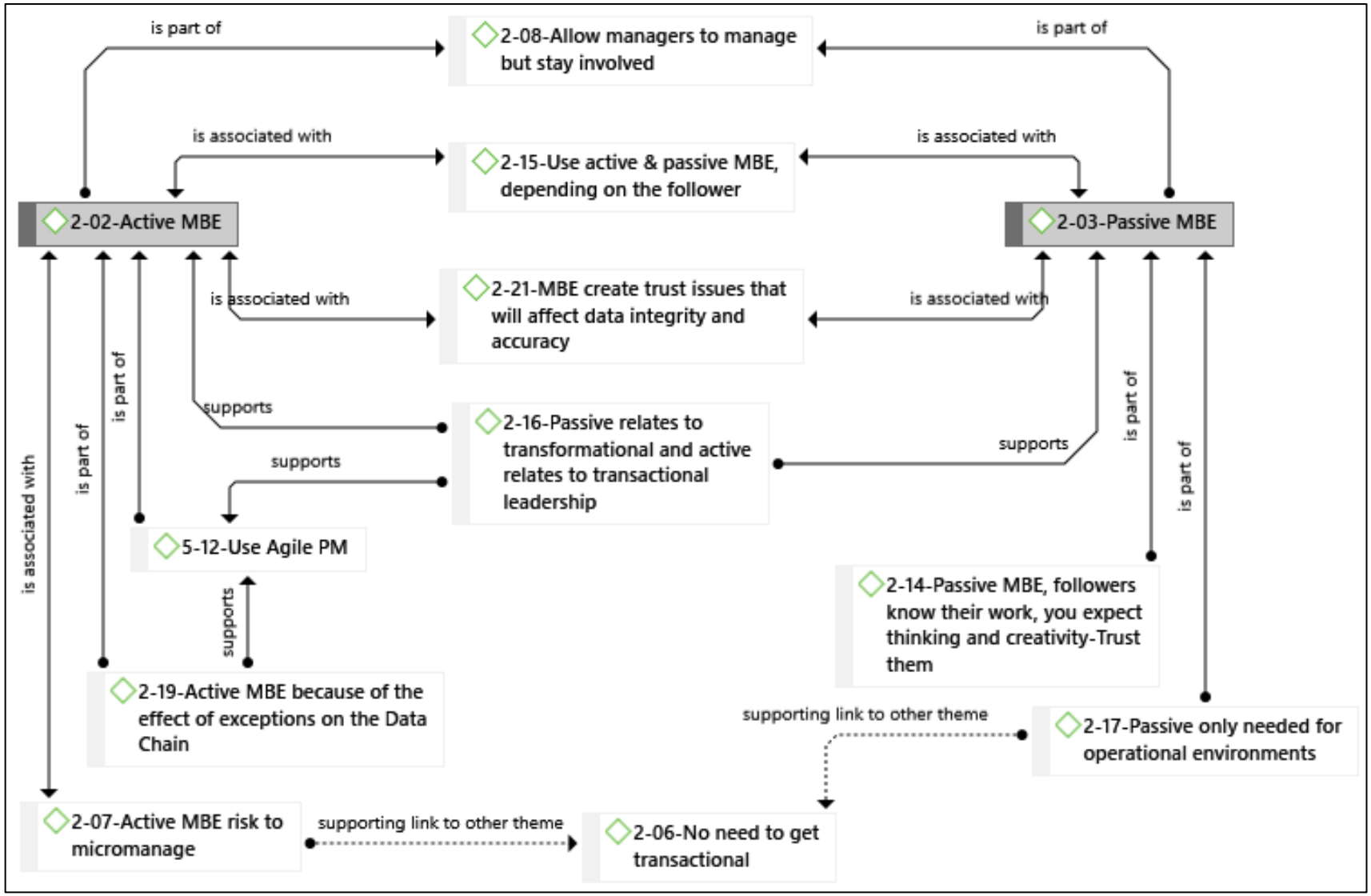

Figure 11: Codes for transactional leader must balance active and passive MBE

Another leader who leads hundreds of data scientists in a commercial sales driven environment had an analogy that he brought down to middle and lower management and even front-line workers. He explained that the leader needs to adjust his active or passive MBE approach to the specific follower (Code 2-15). He sketched it as follows,

> *"there are some people who you got to really paint the picture, you got to start almost. There are some people, you can give them the canvas, explain and they will draw. There are some people where you draw the lines. And then there are some people where you have to give them guidance around the colour, you got to put blue where you want it coloured blue, you got to put yellow where you want, you got to put all the dots, and they come in and fill in the whole shading of it. And I think the only way you are going to get your optimal out of your team, is by matching the style to the person." Participant 5.*

He then explained that even though he is convinced that a leader needs to fit their style to the specific follower, he prefers the passive MBE style. He supported this preference by saying a leader needed to be clear what is required and then give the followers the opportunity to perform (Code 2-14). He rounded this off by saying,

> *"you do not hire smart people to do whatever you say, you hire smart people to think." Participant 5.*

One leader felt that passive MBE could be equated to transformational leadership and active MBE to transactional leadership (Code 2-16). He then portrayed active MBE as a daily scrum meeting where agile project management methodology is applied, compared to a monthly status meeting that a passive leader would rather do (Code 5-12). When focusing on big data decision making capability, he did mention that an agile approach works better, and that he supported active MBE in that sense (Code 5-12). This was supported by another leader when she said,

> *"probably the active one is important, especially since we are talking about a chain. So for me, the fact that the ultimate information that you need for the decision making follows a process, this is a process in place. And I think, by doing passive management by exception, you might find a problem further down the chain, and you could have, prevented re-work in several steps before that. So in my mind, probably the active management by exception would then resonate." Participant 10.*

This view that the quality of decisions from the data chain will be enhanced by active MBE was supported by another leader (Code 2-19). Using agile project management for execution (Code 5-12) was supported by 12 of the leaders, but they did not all tie it back to active MBE.

Some used it more to say the goals needed to be set to cover shorter periods and frequently aligned to their dynamic markets. They felt that using longer waterfall type approaches with long term goals will not be beneficial for creating a data chain that enhances the organisation's big data decision-making capability.

A leader in the mining industry argued that MBE, active and passive, creates a culture of fear and that the data will be distorted due to that (Code 2-21). When talking about the element of the data chain and how MBE affect them he said,

> *"we do find that people are fearful, they are scared to give us information, or they give us information that they think we want to hear. Because if they tell us the truth, they are going to be managed by exception, or that active management that you refer to. So the other side gives a very different space where data is manipulated, it is manipulated to give leadership a specific view, which is not necessarily a reflection of the reality, because it is a transactional environment, as you described." Participant 4.*

He then supported this further by saying,

> *"data will always be manipulated, because there is a bit of fear in the culture because people think, well, what do I give to management? You are not going to get the facts. You are going to get a manipulated, set of information, or data that comes from leadership. And I do not think people are going to be very motivated and inspired to be able to provide the truth, and the factual things about what is going on underground." Participant 4*

He then explained that he preferred a transformational style of leading and not managing by exception at all when it comes to developing new data initiatives. Another leader had a similar view and mentioned that passive MBE is only needed for operational environments (Code 2-17). He explained that in an operational environment, the followers know what to do, and the leader can use a more passive approach. When looking at active MBE, three of the leaders warned that it could lead to micromanagement (Code 2-07) because of its characteristic of active involvement. Both these views, active MBE that has a risk to lead to micromanagement (Code 2-07), and a passive MBE approach only suitable for the operational environment (Code 2-17) support the view in the previous theme that identified that there was no need to get transactional (Code 2-06). This supporting link has been identified by dotted lines in Figure 11.

The feedback around MBE was controversial between many of the leaders, and it was clear that the balance between active, passive and using MBE on an executive level at all needs special attention. Leaders had pointed out that MBE would be needed, but the context would

determine the application. The summary of this topic is that executive leaders need to stay involved in the strategic operations of their business but not disempower the managers. The leadership self-identities and how context affects the use of these self-identities will be discussed next.

5.6. Results of research question 3 – leadership self-identities

The way how the five leadership self-identities can help a leader to create a data chain that enhances the organisation's big data decision-making capability will be discussed in the two main themes that were observed. The first is the need for a strong visionary leader with management skills to execute, and in the second theme, the role of a relational, creative, and community-orientated leader is discussed. Feedback from the leaders on the leadership self-identity concept will also be addressed.

5.6.1 Strong visionary leader with a fine balance of management skills to execute

The first theme related to leadership self-identities is the need for a strong visionary leader with a fine balance of management skills to execute. The codes associated with this theme can be seen in Figure 12, along with the associations that create a network between the codes. The two leadership self-identities that were associated with this are visionary (Code 3-01) and manager (Code 3-04). These original concepts from the literature review in chapter 2 were highlighted in a dark grey colour in Figure 12.

Leaders gave the impression that the visionary self-identity (Code 3-01) was essential for painting the picture of the future that uses data-driven decisions. The visionary leader needs to make sure the followers buy into and believe in the vision for the future. One leader of a large bank looked at the leadership self-identities and said,

> *"the first one is visionary or futuristic. The leaders have to understand where their world is going, where their businesses are going." Participant 12.*

Another supported it by saying the visionary self-identity is her first choice,

> *"because if you are not visionary, then you are not going to be asking the right questions, you are not going to be setting sail in the right direction. You could be fantastic at making big data decisions, but they could be completely irrelevant." Participant 7.*

When another of the leaders reflected on his own big data journey, he said,

"my role has always been sort of the visionary piece along with another part, along with the guys. But that is probably the closest one to me. I think having the vision is very important in articulating that properly." Participant 2.

Someone else supported the idea of making sure the vision is relevant by saying,

"in order to be visionary, you need to understand operations." Participant 6.

This view that a visionary leader needs to know the operations and be able to make the vision practical (Code 5-41) was supported by three leaders. They emphasised that a visionary leader needs to look at the future and, make it relevant and practical for today.

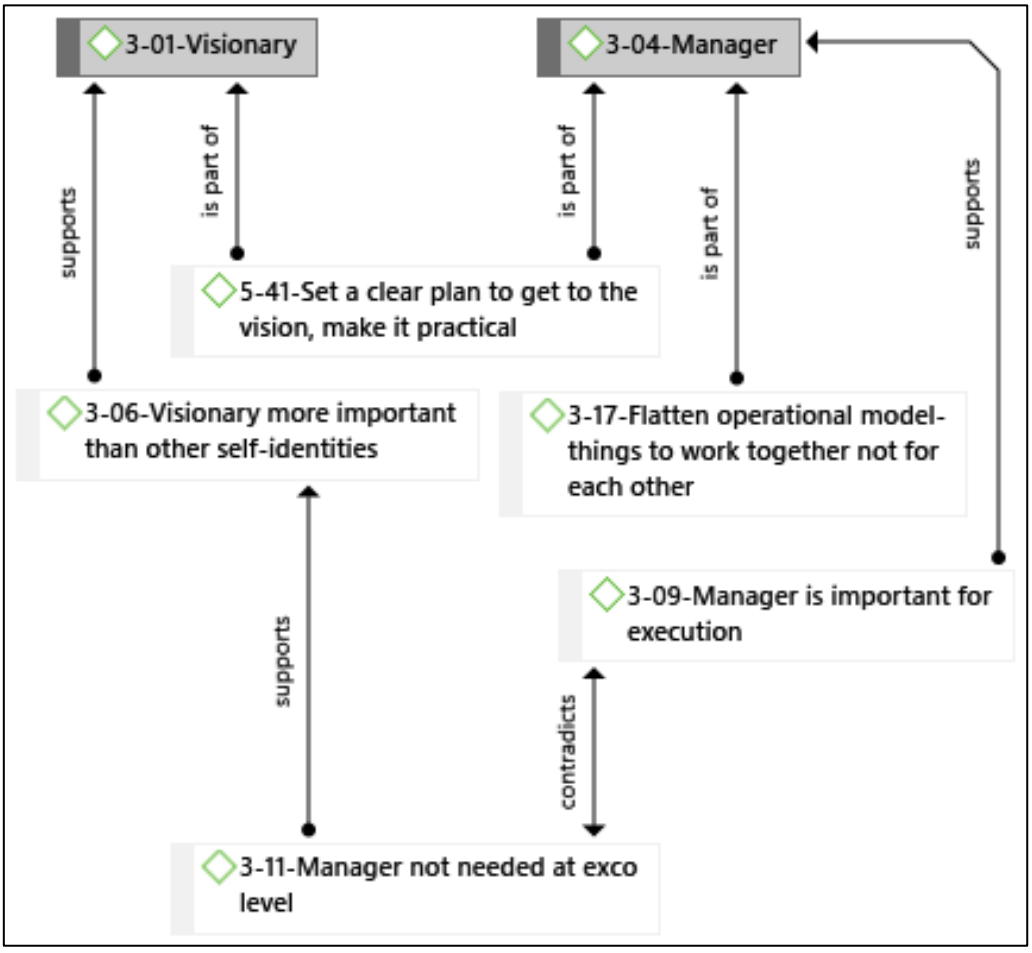

Figure 12: Codes for the need for a strong visionary leader with a fine balance of management skills to execute

Nine of the participants supported the idea that visionary leadership self-identity needs to be supported by the management self-identity (Code 3-04). A leader in an industrial concern commented,

"the guys that you find, moving and shaking, so they can see themselves as visionary, but also very effective managers in their own eyes." Participant 8.

While supporting the view that visionary leadership self-identity is the most important, two other leaders expressed their view that the manager leadership self-identity is not needed at an executive leader's level (Code 3-11). They felt that painting the vision was most important, and that the lower-level managers could execute. One leader motivated that the manager self-identity was not that important (Code 3-11) by saying that visionary was,

> *"probably more important than being the manager because it is no use you want to manage it, but you do not have a vision." Participant 8.*

Another leader supported the lower importance of the manager self-identity when she said,

> *"a manager would be someone lower down, and you should not be relying on your CEO or your exco member. Your senior leadership should not be managing". Participant 7.*

She tied the manager self-identity back to transactional leadership. She added that,

> *"I think there is a risk, that people think that because we are talking about big data here, that the leader needs to manage to make sure that the answers are right, absolutely not." Participant 7.*

She explained that just as a leader appoints someone to look at the financials of the organisation and the leader does not need to check every detail, the leader also does not need to check the details of big data analytics. When looking at the manager leadership self-identity, another leader supported the view that it was not that important by saying,

> *"the managerial aspect is key, but it's less influential. Because once you have the other characteristics, they constitute what is a minor." Participant 12.*

He went on to comment about the organisational structure and proposed that the flattened structure has to be used so that the functions can work 'with' each other rather than 'for' each other (Code 3-17). He explained it by saying,

> *"flatten the operational model because you almost want things to work together, other than to work for each other. From a managerial aspect. So it is almost still managerial, but it is a new way of managing things." Participant 12.*

Despite these two views that the manager leadership self-identity is not needed, seven of the other leaders motivated that the manager self-identity certainly has its place in the execution part of the big data decision making capability improvement journey (Code 3-09). One leader drilled down to this point by saying,

“I will tell you why manager is important it is because of the execution capability.” Participant 3.

Another leader explained that,

“the manager [leadership self-identity] is an interesting one because you can have all the vision, you can have all the relationships, and you can have all the creativity, but if you cannot implement, it means nothing.” Participant 5

He explained that he would rather call the manager leadership self-identity ‘implementation’ because of the negative connections he has with the word manager, but he still sees it as very important for execution (Code 3-09).

In summary, the leaders felt that a visionary leader was needed to set the vision, inspire the team to pursue the vision, and articulate the goals practically by focusing on current possibilities. Having an adequate measure of manager leadership self-identity for the execution part of this vision is crucial. To determine the adequate measure of this manager leadership self-identity is a delicate balance for an executive leader. Some leaders did not see it as important, but others placed a high priority on it. If the leader does not regard the manager self-identity as important, then a lower-level leader needs to be strong at it.

With the role of the visionary and manager leadership self-identity explored the other equally useful self-identities will be discussed next.

5.6.2 The role of a relational, creative, and community-orientated leader

The second theme that was identified is the specific role that a relational, creative, and community-orientated leader can play to enhance big data decision making capability. The codes associated with this theme are depicted in Figure 13, along with the associations that create a network between the codes. The three leadership self-identities that were associated with this are relational (Code 3-02), creative (Code 3-03), and community orientated (Code 3-05). These original concepts from the literature review in chapter 2 were highlighted in a dark grey colour in Figure 13.

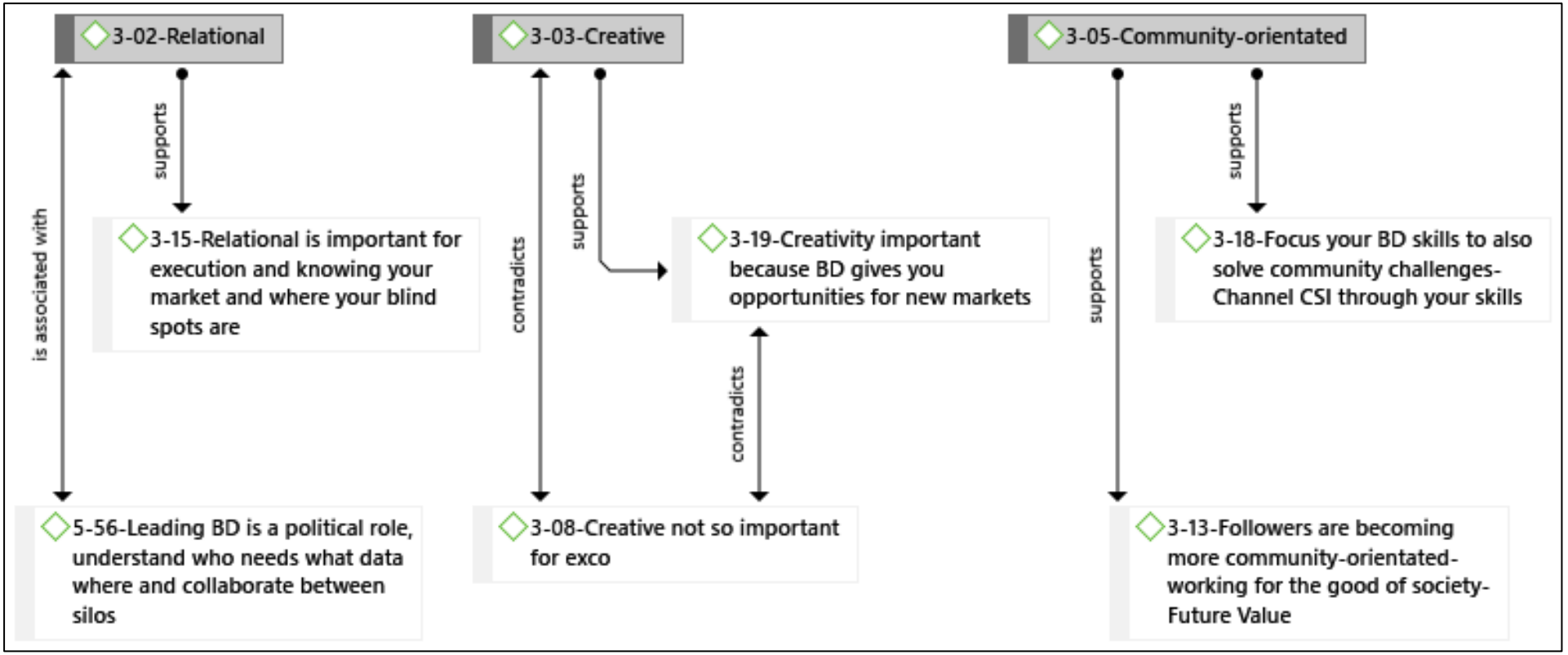

Figure 13: Codes for the role of a relational, creative, and community-orientated leader

Relational leadership self-identity

Many of the leaders have placed the relational self-identity (Code 3-02) second, above the manager self-identity that was associated with the first theme under leadership identities. When they mentioned visionary self-identity, they also included relational to support the vision. One leader motivated this by saying a leader needs to focus on relationships, and that it is relationships that are,

> *"getting people to work, because a lot about data is about people. So the ability to build relationships, work to connect the business and connect people together." Participant 2.*

This was supported by a leader from the banking industry, noting that,

> *"relational is very important because relationships help build the engine of operation, and relational also allows you to understand the real world." Participant 12.*

He explained that through relationships, the leader is able to gain insight into what the data is saying about the market and where the blind spots are (Code 3-15), for example, what the customers think, how things are changing and what risks are prominent. He argued that if a leader was not relational, the insights would not be gained because the leader would only be in a high office (ivory tower) and not build relationships with followers. The insights hidden in the data would be lost. He summarised this by saying,

> *"being relational is a big recipe for leadership because you get people to whisper to you, you get people to show you that to contribute information that helps you make better decisions." Participant 12.*

Another leader concluded the feedback on the relational self-identity by saying it is important to have,

> *"the ability to be empathetic with the organization as you are trying to transform or trying to help make better decisions." Participant 8.*

Two other leaders mentioned that relational self-identity is important because leading big data initiatives is a political role (Code 5-56). An understanding of which data is needed where in the organisation and collaboration between silos in the business can be enhanced by relationships. A leader needs to build relationships that can help with the political aspects of managing all the different links in the data chain.

Creative leadership self-identity

Ten of the leaders agreed that creative self-identity (Code 3-03) is important. When asked about it one leader was enthusiastic when she replied,

> *"Absolutely! To me, that is important. Because perhaps the same questions are asked, but there are new ways to be able to answer the question. So it has to be someone who can wrap their head around the fact that things can be done in different ways. And that there are different ways for problems to be solved." Participant 7.*

Another leader elaborated on the creative self-identity extensively and started by saying,

> *"being creative is another one, because if you are not creative, you are not able to optimize the value of your data. But you are also not able to get to smarter decisions." Participant 12.*

He then added,

> *"creativity is a culture. So when you give people data, they must start asking themselves, what is the best way? Could we do this? What is the shortest way? What is the cheapest way this data could make our customers happy? What is the cheapest way we could maintain our systems to prevent failure using this data. So then creativity becomes a culture, and it is a culture that stems from the leadership." Participant 12.*

He mentioned that they have company-wide quantitative innovation competitions around data to encourage creativity. He also added that

> *"data is a goldmine when you give it to someone else, they will look at it as a stone, someone else will see an opportunity for gold, someone else will see silver in it, it depends on the level of creativity." Participant 12.*

By creatively looking at data, new possibilities can be found, and this includes possibilities for new markets (Code 3-19) and ways to optimise processes or encourage teams. Creatively thinking of ways to solve business problems differently by using the insights from the data is important.

There were other leaders who did not regard the creative leadership self-identity as very important (Code 3-08). One leader felt that there would be scaling problems on an executive level if that leader gets too involved in the creative and manager leadership self-identity. When reflecting on this, he said,

> *"so I do not necessarily think it is wrong for the executive leader to get involved with the creative and with managerial activity. But what that does create is, it will limit your*

bandwidth. So I would rather say, to ensure that you have got the right creatives on your team, as well as managers, and to have an engagement around governance of those two processes would be more important to me than actually for the executive leader himself to be a creative or manager." Participant 10.

Another leader made a short comment saying,

"creative, I do not know if that is necessarily the most important self-perception." Participant 8.

As with the manager self-identity in the previous theme, the fine balance of how much creativity must be used at executive level is important. Leaders felt that it is important to have a creative team member looking at opportunities, but the executive leaders themselves had to be mindful to not be too creative.

Community-orientated leadership self-identity

The community-orientated self-identity (Code 3-05) was more prominent than anticipated. Nine of the leader supported it as being important in assisting the organisation to be more data-driven. Although she mentioned that it did not come to mind predominantly, one leader said,

"the things that would make your decisions higher quality linked to community-oriented is that you would take a broader view on your impact. You know, the age old triple bottom line reporting, and taking into account sentiment from the context within which it operates." Participant 7.

She went on to say,

"I think that you could still make great decisions and using big data if you were not community orientated. So I do not think it is the quality of the decision based on big data that is impacted a lot by whether you are community-oriented or not. It is your impact as an organization that is affected, whether you are community-oriented or not." Participant 7.

Another leader supported the community-orientated self-identity (Code 3-05) more strongly by saying data scientists are motivated differently and,

"most of them want to use their work for something good, or something to improve society." Participant 5.

He and two other leaders mentioned that followers are becoming more community orientated and want to use their work to add future value to society (Code 3-13). He gave an example of

when his organisation did pro bono work for the government. He did not give his permanent employees extra incentives for doing the work, and he temporarily employed 132 extra unemployed people to do the bulk of the repetitive work. He remarked that his employees

> *"knew there was a very important task to fulfil that our government needed, which was to get through the backlog of tests. And to this, they felt great. When they got emails and thank you's from 132 unemployed youths saying how this money really helped them, or how this worked out for them because somebody in their home had cancer. The emails just came in flooding. So that for me is also rewarding." Participant 5.*

Another leader mentioned that he sees value for the organisations in the future to focus on using big data initiatives to contribute to the wellbeing of society. He called it 'data for social good' and argued that traditional corporate social responsibility (CSR) initiatives could be enhanced though big data skills (Code 3-18). Examples he gave was that it could assist with clean energy, climate change and improving safety in society, all this by using data-driven initiatives. He went on to explain that,

> *"*being *community-oriented is key because traditionally, we have seen organizations as services and products that they offer. But it goes beyond that. There are economies in communities that use our services and products. And where the world is going, those committees are loyal to those solving their challenges. In fact, in the future, to the challenges will be a brand, so if you are a mining company, you could be a climate company, supported by mining services, so community benefits from the climate." Participant 12.*

Yet another leader supported the community-oriented self-identity by saying,

> *"all companies are focusing on utilizing the data to be community orientated, and I think that is where the words ecosystem thinking comes in these days. It is about utilizing data to work across different ecosystems, and through working through ecosystems, you solving community issues, like education, or poverty or whatever it is." Participant 6.*

Another leader supported this when he remarked the community must be seen as part of the business. He supported ecosystem thinking when he mentioned that big data could give insights into aspects that are in the ecosystem of the organisation, and if the leader is too internally focused, the insights will be lost. He argued that,

> *"we tend to want to be so internally focused and forget about big data that informs around risks that are happening within our fence line of operations. And that is going*

to be critical that a leader is not only internally focused but also expand the ecosystem to be much more inclusive to the community where you operate." Participant 6.

The leaders felt that the community-orientated leadership self-identity has a significant effect on how big data can enhance decision making. Being more community orientated can affect the business model of the organisation, and leaders need to make sure they focus more on adding value to the larger society.

The feedback from the leaders interviewed on the important role of the relational, creative, and community-orientated leadership self-identity in making more quality decisions based on big data has been discussed. Next feedback from the leaders on the leadership self-identity concept will be addressed.

5.6.3 Feedback on the leadership self-identity concept

The leadership self-identities is a new concept, and the leaders were therefore asked to comment on it. Their feedback will be given to support any further development of the concept. The codes associated with this feedback on the leadership self-identity concept are depicted in Figure 14, along with the associations that create a network between the codes. The five leadership self-identities from the literature review in chapter 2 were highlighted in a dark grey colour in Figure 14.

Three of the leaders explicitly mentioned that they did not see any specific leadership self-identity that has not been listed (Code 3-07). One leader mentioned that he would add attention to the leader's mindset (Code 3-10). He explained it in this way

"I think one that has come in lately is the whole mindset. What is happening between the two ears. The mindset of inward versus outward, from a leader. Do you just want to achieve because you want to or are you also outward, so it is, building on the relational a little bit. But the mindset of a leader is quite important. To make sure that you are always engaged as a leader. So mindset is the only one that I think is missing." Participant 13.

Another leader suggested that the intellectual self-identity was missing (Code 3-14). He explained it by saying,

"I would add in the intellectual piece because if the person leading them does not have a good in-depth, intellectual understanding of what he needs to do, or what the business does, everything starts becoming diluted." Participant 5.

Another leader agued for a value driven self-identity to be added (Code 3-20). He said,

"something which is quite an important characteristic is being value-driven. And so having a nose for the dollars, if you like, knowing where to focus." Participant 8.

He explained how he misread the relational self-identity for being rational and added that being rational,

"resonated to a degree, so whether that fits within somewhere between creative and manager, I am not sure. But I think that relentless focus on value, that kind of continuous improvement of excellence. That drive for excellence and drive for kind of understanding continuous learning is something which will be more highly valued within management." Participant 8.

These three additional leadership identities have been shown in Figure 14 with the contradicting links to the other leaders that felt there was no leadership self-identity missing (Code 3-07).

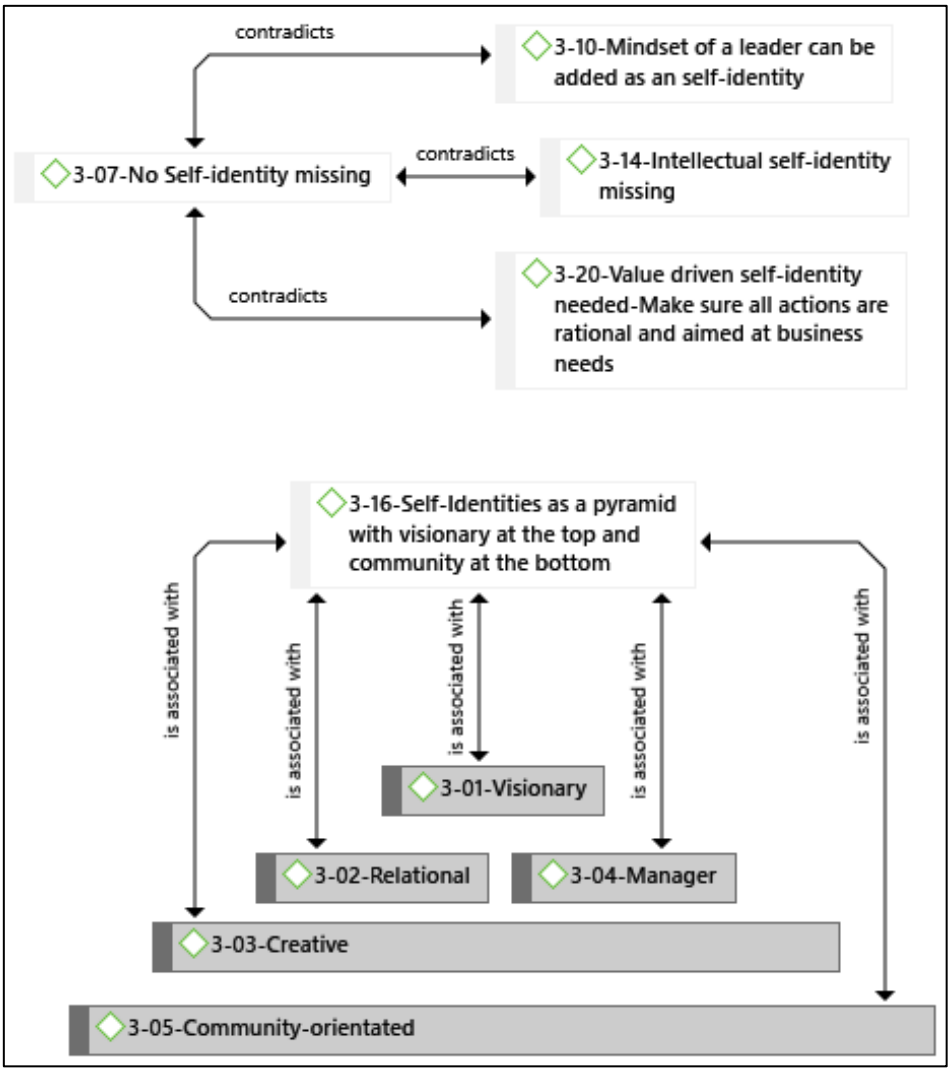

Figure 14: Codes for the feedback on the leadership self-identity concept

One leader had an interesting way of seeing the leadership identities. He mentioned that when looking at the five leadership self-identities, he would,

"put it in a pyramid, a pyramid from one to five, the top being visionary" Participant 11.

His view has been illustrated in Figure 14 with the pyramid of the leadership self-identities (Code 3-07). The manager self-identity (Code 3-04) has been placed on the second level based on the feedback from the other leaders in the first theme identified under leadership self-identities.

Further discussion regarding the leadership self-identities concept will be done in the next chapter. The results from how context affects the adequate leadership style that can enhance big data decision making capability will be provided next.

5.7. Results of research question 4 – contextual leadership

The feedback on how the appropriate behaviour of a leader in different contexts can help to create a data chain that enhances the organisation's big data decision-making capability will be discussed under the three main themes that were observed. The first is the need to adjust leadership style to where the leader is in the big data journey or what the context requires. The second is that the leader must be committed to data-driven decisions and use an applicable leadership style to enhance the data. The third is the observation that the strategy should drive leadership style.

5.7.1 Adjust leadership style to where you are in the big data journey or what the context requires

During all the interviews leaders mentioned that the specific leadership style required depends on the context or the situation. This observation was made at different stages of the interviews. Some leaders indicated this when transformational leadership was discussed, others when transactional leadership questions were asked or when the leadership self-identities was the focus of the discussion. The first theme under contextual leadership that was identified is that leaders indicated that it is essential to consider where the organisation is on their journey to become data-driven, and what the context requires when applying different leadership styles. The codes associated with this theme are represented in Figure 15, along with the associations that create a network between the codes.

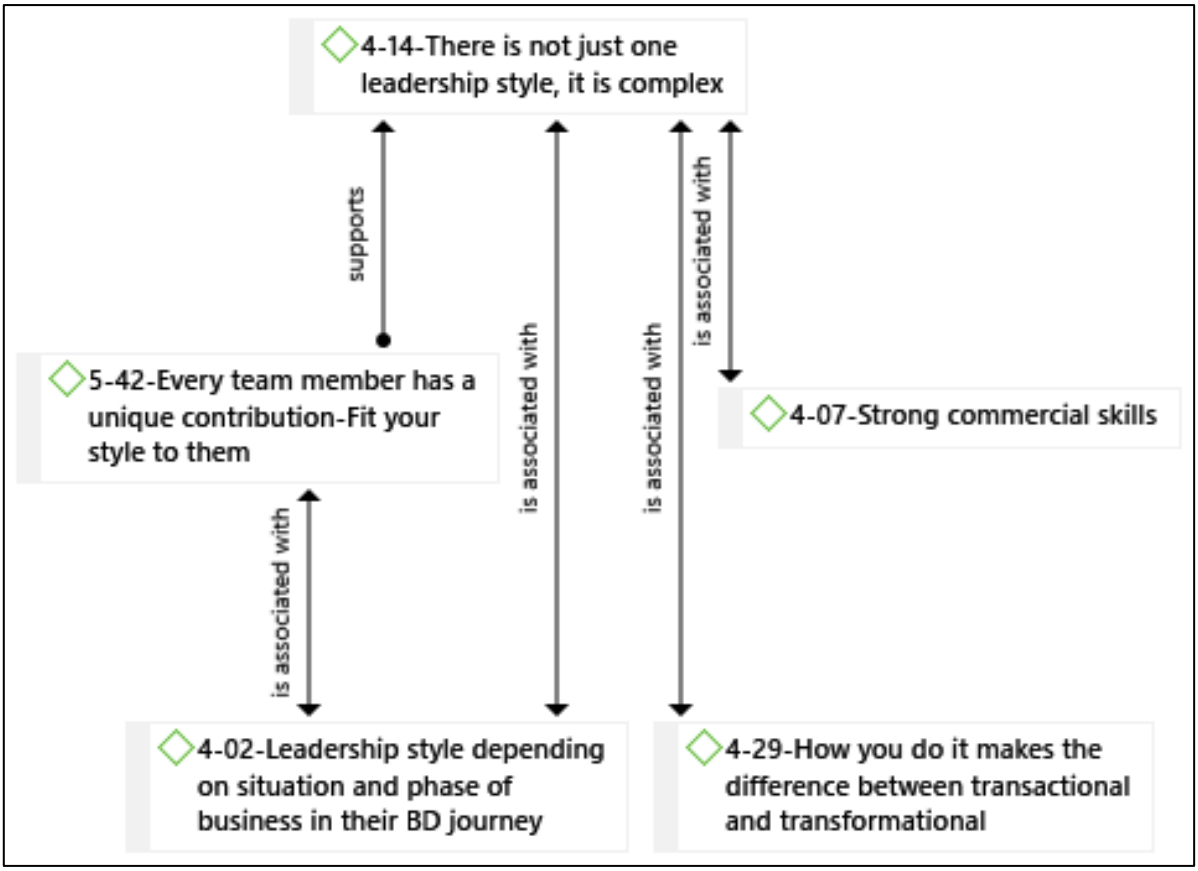

Figure 15: Codes for the need to adjust leadership style stage in data-driven journey and what the context requires

One leader mentioned the importance of context in leadership style selection several times. First, when he was asked about the four dimensions of transformational leadership, he replied:

> *"I think probably the best answer to say that it is not one style that is going to work. There are times where I have got to be that, but there are times I have got to be dogged, and I have got to be demanding, and I have got to demand performance which is not charismatic in its nature*." *Participant 2.*

While still discussing transformational leadership, he explained that there was not only one style of leadership that enhances big data decision making capability, and it was more complex than that (Code 4-14). He argued that there should be a balance between transformational and transactional. Five other leaders also agreed that a leader has to be careful not to lean to only one style and rather implement a balance between transformational and transactional (Code 4-14).

Adjusting the leadership style to the specific team member and the leaders own personality was also a common thread through the interviews and can be seen in the next few paragraphs

(Code 5-42). This was explicitly supported by five leaders. One leader reflected on his visionary style of leadership, and added that

> *"there is also times within my style that it is not necessarily the best in class. Then I am happy to hand over to the next guy because now they need to get stuff done. They need to get on with the job, they need to figure out the answer, they need to go fix it, they need to figure it out." Participant 2.*

He continued saying that,

> *"there is no one silver bullet, but it is being able to move comfortably between the different styles that are needed in order to deliver the outcome or get you to where you want to go." Participant 2.*

When asked about transactional leadership, he again alluded to contextual leadership by saying,

> *"so what you are seeing now is that like more and more in this world is, that the need to pivot and move and transact, change between these different styles is becoming very important. Being able to be both leaders at different times." Participant 2.*

At the end of the interview, he summarised that,

> *"the successful leaders are those that can adapt to these different phases of the last cycle of the organization". Participant 2.*

He concluded with:

> *"Successful leaders are able to move seamlessly between these different elements you have spoken about, and understand how to always get it right, but understand how to do the best to become relevant to that future." Participant 2.*

When asked about the leadership self-identities, another leader replied that he,

> *"would think that it really would be situation-specific." Participant 10.*

He then said all leadership identities were important, but the situation would dictate which one should be used. In another conversation, one leader reflected that

> *"depending on where you are, in your cycle towards becoming data-driven, and you would use a different approach. So horses for courses." Participant 7.*

At the end of the interview when she was asked for additional comments, she added that she would be,

"interested to see what that relationship is, because is it just that we go back to the construct of situational leadership, you know, the horses for courses, and depending on where you are in the journey, you need a different style." Participant 7.

When someone else was asked about the five leadership self-identities, he echoed the same perspective by saying,

"I think they are all beneficial. They are all beneficial and interrelated because it all depends on the stage that the company is in terms of their big data architecture." Participant 6.

This view that leadership style must be changed depending on the situation and the phase of where the business is in their big data journey (Code 4-02) has been supported by eleven of the leaders.

At the beginning of another interview a leader was asked about his default leadership style. He replied his leadership style was

"much more participative and a bit more consultative, but it is all about balancing each of those. Because, in my simple definition of leadership, is a leader is a match between a situation and a person in a moment in time." Participant 4.

This concept of adjusting the style to the individual (Code 5-42) was supported by another leader, saying:

"I think the only way you are going to get your optimal out of your team, is by matching the style to the person." Participant 5.

This pointed to the individual consideration of transformational leadership (Code 4-07). A leader needs to dynamically adjust his leadership style to nurture the specific follower (Code 5-42).

One leader mentioned a leader needs to have strong commercial skills (Code 4-07) and that was interpreted as being able to understand what makes the business successful and adjust leadership styles to enhance those aspects. Only one leader made this comment. Another leader commented that,

"it is in the how that makes the difference between a transactional and transformational" *Participant 4.*

This was also interpreted as that changing between the leadership styles was possible, and exploring what leadership styles were applicable would be beneficial because it would affect how the leaders behave.

The leaders interviewed indicated that there is a need to adjust the leadership style to where the organisation finds itself in the big data journey or what the context requires. Next, the influence that a leader's commitment to data-driven decisions has on his leadership style will be discussed.

5.7.2 Executive commitment to data-driven decisions and leadership style to support

Leaders conveyed the message that the most optimal way to enhance big data decision making capability was to have an executive commitment to data-driven decisions and then to use the applicable leadership style in order to support the commitment. Adding an element of being pragmatic and analytic to the leadership style was also discussed. This is the second theme under contextual leadership. The codes associated with this theme can be seen in Figure 16, along with the associations that create a network between the codes. The three underlined headings in the section below are indicated in Figure 16 in blue blocks with dotted lines, with the headings also given above each block. These results will be discussed under the three headings mentioned.

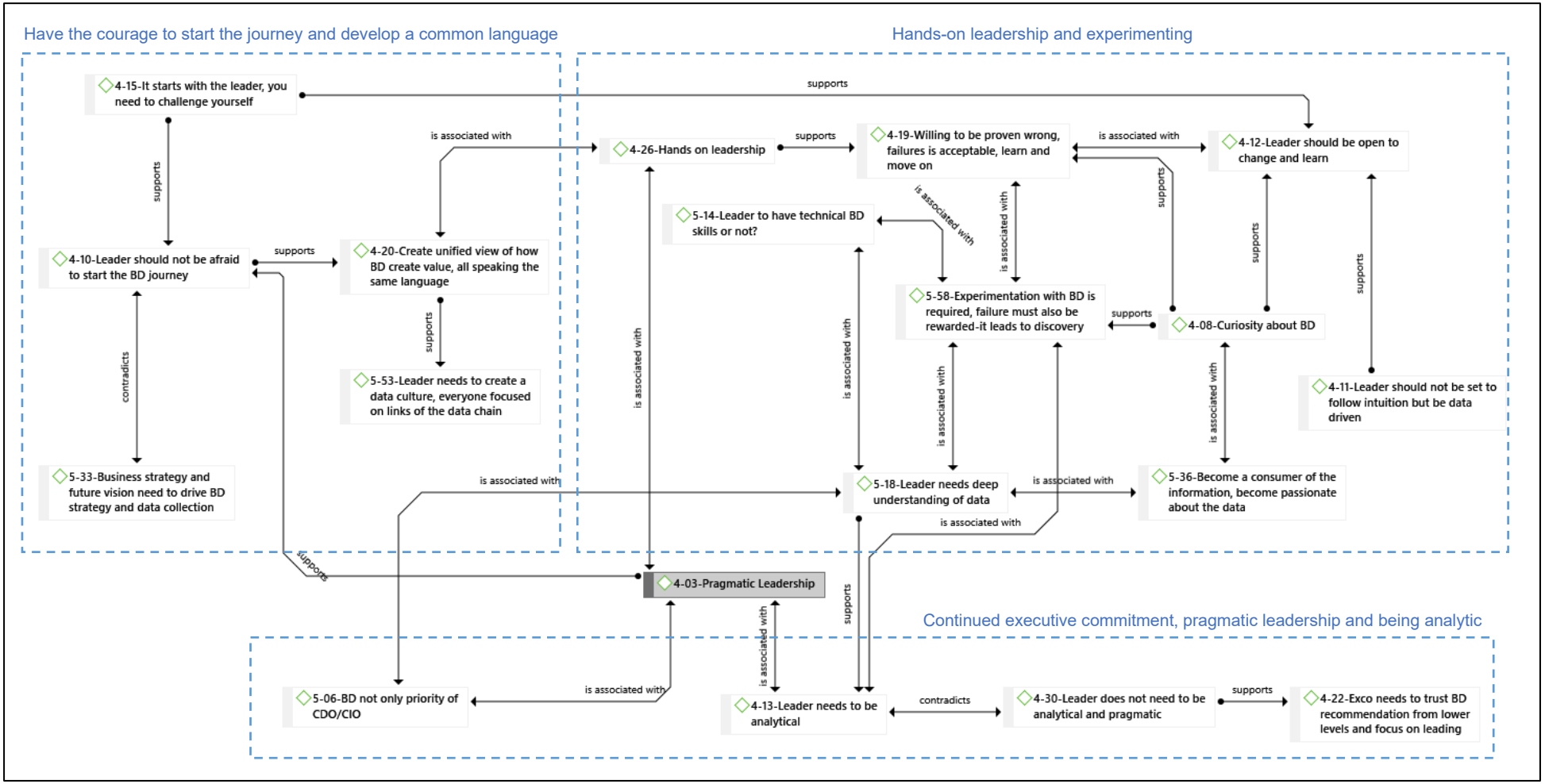

Figure 16: Codes for executive commitment to data-driven decisions and leadership style to support

Have the courage to start the journey, develop a common language and data driven culture

The first feedback regarding the executive leadership's commitment to data-driven decision making is that a leader should not be afraid to start the journey (Code 4-10); three leaders supported this view. One leader said that

> *"they have got to start, first principle, they got to start, they got to transition their leadership to becoming more fact-based. To becoming more based on insights, being open to learning." Participant 2.*

Someone else supported this by saying,

> *"they have to start viewing machine learning and data as tools that can help them make better decisions." Participant 5.*

With another participant was asked how a leader gets his team started on this complicated journey, making sure the data gathering supports the company strategy, he answered,

> *"so that is a very good question, and it is a question which a lot of organisation take years to figure out. So, at first, you got data in the organization, in one form or another, you got some data as a starting point, or you can even start gathering data, where there is an opportunity to gather data." Participant 7.*

He then recommended that

> *"you have got to take a leap of faith to start." Participant 7.*

This comment to start with the gathering of data (Code 4-10) is contradictory to the perspective of other leaders who stated that company strategy needed to drive the data strategy (Code 5-33). This view that business strategy comes first and data should only be collected if it supports the overall strategy will be compromised if a leader starts collecting data randomly for the sake of starting with the journey. Six leaders supported the view that company strategy needs to drive the data strategy (Code 5-33). The leaders that supported the recommendation to simply start gathering the data were supporting the pragmatic leadership style (Code 4-03), while the leaders that said one should start with an empty canvas and paint the picture were advocating a more visionary and inspirational style. The pragmatic leadership style (Code 4-03) is shown in a dark grey colour in Figure 16 because it has been reviewed in Chapter 2; those leaders are focused on the task at hand and solving problems. Two leaders explicitly a supported pragmatic leadership style by mentioning it by name (Code 4-03). When returning to the view that leaders should not be afraid to start the big data journey (Code 4-10), three other leaders mentioned that this should start with the leaders challenging themselves (Code 4-15) and the status quo.

Leaders then went on to explain that the setting up of a common language was critical (Code 4-20). One leader enthusiastically explained it by saying,

> *"I think one of the core things is being data-driven is speaking a language. And one thing a leader can do, first and foremost, and this is from my personal experience, which has contributed to my success, is to make sure the whole organization is speaking the same language. How do you do that? You have to make sure that the organization is data literate." Participant 12.*

He explained how it iswas critical to make sure everyone understood the value of the data and how it could create benefit. Six other leaders supported this by agreeing that a leader needed to create a data culture to ensure every team member was focused on the links in the data chain (Code 5-53). One of these leaders stressed it by saying,

> *"it is around creating a unified view of the value of what needs to be driven." Participant 7.*

Consensus gathered from the leaders on this point was that the leader has to have the courage to start the journey and then ensure that the whole team was aligned. This would require the applicable leadership styles for the specific context.

Hands-on leadership and experimenting

Linking to the need to create a common language (Code 4-20), one leader gave advice by recommending that when the journey is started a hands-on leadership style is required (Code 4-26). He referred to the transformational and transactional leadership styles and leadership self-identities that were discussed, when he explained as follows:

> *"hands-on leadership is when you look at all the three traits, including the five on the third category, it is more about hands-on, it is about involvement, it is about killing the [management] tower and being involved in the thick of things." Participant 12.*

He then remarked that,

> *"even if you have made a mistake, you quickly correct it together with your team." Participant 12.*

This willingness to be proven wrong because failures were acceptable if you learned from then (Code 4-19), has been supported by four leaders. The same leader that encouraged hands-on leadership (Code 4-26) went on to link it back to leadership style and the need to experiment by saying:

"The other aspect is as part of the transformational [leadership, intellectual stimulation]. Using data and technology, there is a lot of experimentation involved, which also includes a lot of trial and failure. The process of trial and failure must also be rewarded because it leads to discovery." Participant 12.

This view that experimentation with big data is required and failure also has to be rewarded because it leads to discovery (Code 5-58), has been supported by three leaders. One of those leaders said that this experimentation mindset and understanding the playground are important. He explained:

"if there are things missing the data scientists can continuously evolve, or continuously develop, that model. Because sometimes, people say this is what you want, these are the five things. Then everybody goes away to look for these five things. And then they come back with those five inputs only. So what we found now was that you need to be [more exploring to gain insights], there is no clear answer to anything. You asked the data scientists do X over Y, give you an answer, then you turn, change it to Y over X, and this actually gives you a different answer. So it all depends, you need to understand the input. So how you can manipulate the data if that makes sense." Participant 11.

The ten leaders expressing this point of view felt that a leader needs to have a deep understanding of the data (Code 5-18). By that they did not imply that a leader needs to be technical or understand how the algorithms are implemented (Code 5-14), but that leaders need to have a thorough understanding of the data. One leader explained,

"you have to become a consumer of the information, not just ensuring that the process of data works in your business. So that is a big leadership evolution, to actually becoming a data user and a data consumer as a leader is equally as important." Participant 2.

This need to become a consumer of the data (Code 5-36), and another view that a leader needs to be curious about the data (Code 4-08), both support the need to experiment with the big data (Code 5-58) and express the notion that the leader needs to be open to change and learn (Code 4-12). Six participants held the view that leaders should not be set to follow their intuition but rather become data-led (Code 4-11). Another leader supported this idea by saying,

"you need leaders who are passionate about the data. So they need to exhibit that passion for having the numbers." *Participant 8.*

He stressed it by adding:

> "you need a specific type of leader or leadership behaviour, which is very much a nose for the numbers." *Participant 8.*

This passion for the data needs to influence the leadership styles that are used. In summary, being hands-on and experimenting with big data have been identified as being important to the context that determines the leader's behaviour.

Continued executive commitment, pragmatic leadership and being analytic

After the journey has started with this passion for the data, and the team is experimenting with the data and processes, the commitment from executive leadership to being more data-driven must be emphasised. Four of the leaders mentioned that big data should not only be the priority of the data team, but it should be the top priority of the entire executive team (Code 5-06). One leader argued that

> *"it cannot sit with the Chief Digital Officer or the Chief Information Officer, it needs to sit with the exco of the business, that is the portion where they need to be pragmatic about translating strategy to information they need." Participant 3.*

Another leader supported the pragmatic leadership style (Code 4-03) by explaining,

> *"leaders in the data, big data space need to be both strategic, and technical or functional. And I see there is a lack of that in South Africa. Leaders are either very strategic or they are very technical. It is very hard to find people sort of playing the cusp between strategy and technicalities. And with big data, the technical aspect is quite critical. Because you need to understand data architecture, structured versus unstructured data, you need to understand how our data is being transferred from the customer systems into various other systems in your corporate." Participant 6*

The view that being technically inclined was not supported by al the leaders and will be explained later. The connection to pragmatic leadership (Code 4-03) was not on technical bases but rather on the focus on the task at hand, practically understanding big data and the drive to find solutions.

Linking to pragmatic leadership, some leaders argued that being analytic about the business and the process of making decisions based on big data is important (Code 4-13). When discussing the five leadership identities, one leader said,

> *"I actually think the leader needs to be analytic before he is visionary. Because he needs to go and analyse what are the levers that we need to pull are in our business to make a difference" Participant 3.*

He went on to say,

> *"this is one time that a leader actually needs to roll up their sleeves and think about how do you think analytically about the levers in a business before you paint the vision" Participant 3.*

Another leader applied this to an electrical power-generating organisation in South Africa. He explained that the executive leader was analytic about his problem and,

> *"not necessarily just looked at it from a traditional analysis approach of saying we do not have enough generation capacity. That we have to throw capital at new generation capacity. This is far more an approach of let us truly understand why our availability of our power stations is where it is before we make any key decisions." Participant 10.*

He argued that an analytic leader could look at the data and find the root cause behind the problems. There was also an indication from other leaders that being pragmatic and analytic about the business and process should not be overemphasised (Code 4-30). While one leader gave feedback on how analytic and practical a leader has to be about big data, she first looked at herself and stated:

> *"there are strengths, like being analytical, but then I am not analytical, and I do believe in using insights where possible." Participant 7.*

She then explained,

> *"the C suite objective is to lead the organization and prepare it for the future, make money now, do good now, do good for the community, depending on your outlook, and then have a way to sustain it. If I was a CEO, my expectation would be that there is someone who is taking those questions and giving me an answer, and it is accurate. And I want them to use as much information as possible to give me that answer. I do not think that I need to go and make sure that the answer is correct." Participant 7.*

When further explaining her view on the need for a leader to be analytical she said,

> *"this is something we see with our clients. Sort of a typical mistake is to think that your leader has to be analytical. No, your leader needs to know to ask the right question. And then someone else might be the analytical (sic) and to translate, to take the outcome and give you the answer. A leader does not need to be analytical to my mind." Participant 7*

Three other leaders supported the view that the executive leader needs to trust the data from the team and focus on leading rather than checking the data (Code 5-22).

The general feedback was that the executive leader needs to ask the right questions and if they are not analytic themselves, they then need a team member that is analytical and has a pragmatic leadership style.

5.6.3 Strategy drives leadership style

Predominant feedback from the leaders was that the company strategy needs to determine the context that in turn, drives what leadership style a leader should use. This concept is at the centre of many strategy theories and lies outside of the scope of this research. With this said, there is one comment from a leader that did position the influence of leadership on data-driven decision making in context with the strategy theories. She posited that leadership principles,

> *"do not change just because there is more data. The basics do not change because there is more data. It is just that you can change the organization's point of departure." Participant 7*

She continued to say that big data should not change what is important for the leader but big data should rather be used as a tool. Ten leaders supported the idea that strategy should determine the data management strategy and in the end, the applicable leadership style.

5.8. Conclusion

The leaders gave feedback on the use of the different leadership styles and gave a strong message that the appropriate style should be used for the context. This will be discussed with the results in the next chapter

6. Discussion of Results

6.1. Introduction

The results presented in the previous chapter will be discussed in this chapter. First, the participants' view of big data will be compared with the definition of big data and big data decision-making capability in the literature review presented in chapter 2. Next, a conceptual model will be proposed to structure the leadership style discussion. Then the discussion will be structured around the research questions presented in chapter 3, and the results will again be evaluated against the leadership literature reviewed in chapter 2.

6.2. Discussion of the practitioners' view on big data

In this discussion of the practitioners' view regarding big data, their definition of big data will first be discussed. Next, the considerations they have listed will be looked at, and finally, the benefits and challenges they identified will be discussed.

6.2.1 Discussion of the executive leaders' big data definition

The participants view on big data was included in the feedback to set a common platform for the feedback on leadership styles. In this discussion, this feedback will also be discussed so that the definition will be clear for the rest of the discussion and any misunderstandings on the concept of big data can be identified. From the leaders' diverse feedback on the definition of big data, it is clear why there is no agreed definition of big data in the literature, and this corresponds to the remarks by Sena et al. (2019), as detailed in section 2.2. The leaders agreed that big data includes structured and unstructured data from multiple sources, which corresponds to the definition from Akhtar et al. (2019). The leaders included, but did not limit the definition to, the use of data from business intelligence (BI) systems and machine data in their definition of big data. In this context, BI data is from ERP systems or similar systems, and machine data is high volumes of data from machinery in the industrial industries. This view does align with the original 3Vs model that includes high-'volume', high-'velocity' and high-'variety' (Beyer & Laney, 2012). Most of the leaders did not limit the data to BI and machine data, thus the variety is high, and the requirements for the other two Vs are also satisfied because the volume and velocity from these systems are high. The literature reviewed also confirmed the inclusion of BI and machine data in the big data definition. Gendron et al. (2014) included BI data into their big data decision making support article and included a variety of other sources. In this article titled "The BI Sweet Spot" (Gendron et al., 2014, p. 279), they support the inclusion of BI into the definition of big data. Ghaeini et al. (2018) used big data

concepts when doing analysis on machine data and a variety of other sources, and this sustains the inclusion of machine data into the definition of big data.

There were two leaders who did not see a significant difference between BI, machine data and big data, and did not include various other sources in their definition of big data. This view suggests that some leaders might be missing out on the potential benefits from big data and need to explore the concept in more detail. Gupta and George (2016) indicated that advantages that could be gained from the use of big data would be missed if the leadership team does not recognise those benefits. The insight that leaders can gain from this is that they should not be stuck in the BI world and miss all the benefits that big data could add to their business.

For the rest of the discussion of the results, big data will be regarded as high velocity, large volumes of data from a variety of sources that inform leaders of their client's behaviours and needs or improve the running of their operations. The potential to add value to decisions is therefore also enhanced because there now is a proliferation of data because more devices are connected to each other, which contributes to the richness of the data trail, as has been postulated by Janssen et al. (2017). The feedback from the leaders regarding the considerations required to derive benefit from this additional richness of the data will be discussed next.

6.2.2 Discussion of the considerations needed for big data

The leaders confirmed that creating a data chain that enhances big data decision making is not easy and cannot be seen as a simple part of the organisation's strategy, and this is in agreement with the literature that was reviewed in Chapter 2. Janssen et al. (2017) highlighted this complexity of orchestrating the resources to enhance the collaboration between the links of the data chain. Janssen et al. (2017), as well as Gupta and George (2016), emphasized the importance of seeing the resources in the data chain as valuable, rare, imperfectly imitable, and non-substitutable (VRIN). This encompasses the characteristics required of resources in order to achieve a competitive advantage, as described by the resource-based view (Barney, 1991). An insight from the leaders' feedback is that the data itself can also be seen as a resource that possesses the VRIN characteristics because of all the required special considerations mentioned by the leaders. In other words, the data that leads to improved quality decisions is indeed valuable to the organisation, rare because of all the challenges listed and consequently cannot be easily replicated or substituted by competitors. Seeing data as a valuable resource should result in prioritising the investment and development of the

unique tangible, human, and intangible requirements needed to obtain and analyse the data (Gupta & George, 2016).

Shamim et al. (2019) argued that merely having the data as a resource is not sufficient to gain a competitive advantage and leaders play a vital role in the harvesting of the benefit. As observed in the feedback from the leaders, the fast pace of evolution, the need for real-time data and the constant effort to enhance the decision-making capability underpins the need for these VRIN resources to also have dynamic capabilities, as described by Batistič and van der Laken (2019). The dynamic capability view (Teece, 2018) submits that leaders need to make sure they build their organisation's capability to adjust to all the considerations raised by the leaders in section 5.3.2. The fast pace at which the big data field is evolving is confirmed by Mikalef et al. (2018) when they discuss the evolutionary fitness that describes how organisations operate and adapt to a dynamic market. The leaders agreed that their leadership style does play a significant role in their organisation's ability to make quality decisions from big data.

To conclude the discussion on the special considerations required to secure benefit from big data, the observation that big data is a valuable resource and needs to be dynamically used to gain a competitive advantage will need to be integrated into the selection of suitable leadership styles and behaviours. The complexity of the considerations indicated that getting value from big data was not simple. These benefits and challenges will be discussed next.

6.2.3 Benefits from big data, and challenges to achieve the benefits

The leaders confirmed that they did experience or do foresee benefits from basing their decisions on big data and this was also observed by Akhtar et al. (2019) when they stated that organisations using big data for decisions perform better when compared with organisations that do not focus on insights from big data. Other literature reviewed also supports the concept that leaders obtain more benefit by using big data to inform their decisions (Gendron et al., 2014; Janssen et al., 2017; Mikalef et al., 2020; Pigni et al., 2016; Wamba et al., 2017; Zeng & Glaister, 2018). The ten leaders who submitted there was significant room for improvement when it came to organisations benefiting from big data, build on the view that big data is regarded as a resource that it is difficult to imitate or substitute. If it were easily imitable or substitutable, many other organisations would have replicated it because of the proven advantages, as observed in both the literature and by the leaders that were interviewed. The challenges such as not understanding the concept of big data, the high investment cost, or legacy equipment preventing the benefit all contribute to the resource being difficult to imitate.

With the notion that big data is a resource that is valuable and difficult to imitate discussed, the leadership styles required to enhance the benefit will be discussed next.

6.3. Overall discussion on leadership styles

The feedback from the leaders regarding the leadership styles that influence big data decision-making capability do overlap in many aspects; this was also borne out by Anderson and Sun (2017). To give more structure to the discussion, a conceptual model, presented in Figure 17, has been developed. The leadership self-identities (Anderson & Sun, 2017) are used as main headings for the triangles, except for the triangle in the middle that was changed to ‘execution’ due to the alternative perception of the word ‘manager’. Some participants did mention that the word ‘manager’ is associated with micromanagement, and for this reason the word was changed to ‘execution’ in the conceptual model. The dimensions of transformational and transactional leadership (Anderson & Sun, 2017) are indicated with stars in front of the text. When a dimension of a leadership style was predominantly applicable in more than one leadership self-identity triangle, then a rectangle that overlaps the triangle was used. The location and areas that touch sides with the triangles are important. For instance, visionary has been placed at the top because it provides guidance for the rest of the triangles. Execution has been placed in the middle because it affects all the other areas, and therefore touches sides with all the areas. The community-orientated self-identity provides the foundation for the model. The specific research questions that relate to the specific words that were used are shown on the right-hand side. During the discussion of the results, reference will be made to this conceptual model, and more detailed arguments will be made on why the model was designed this way. Transformational leadership will be discussed first.

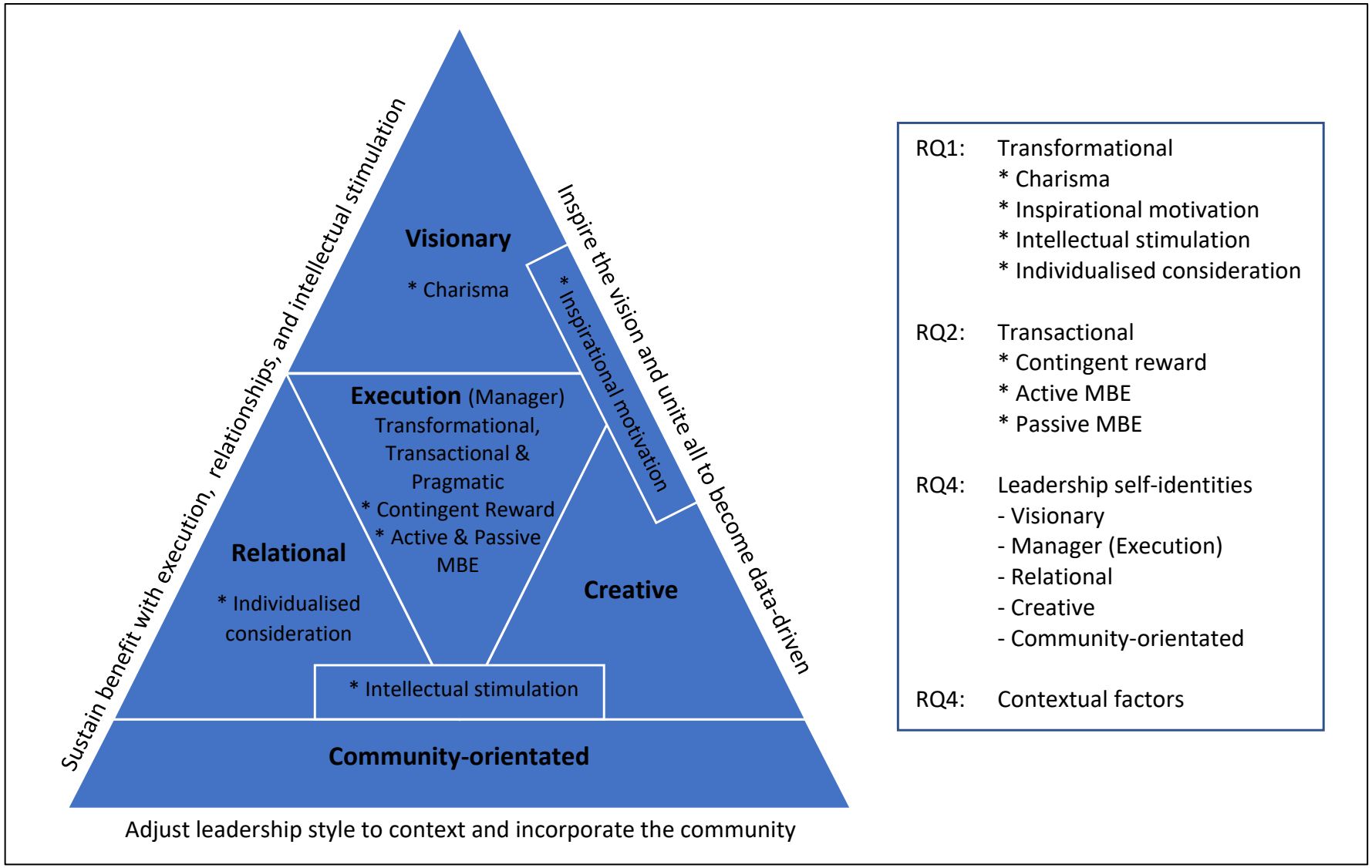

Figure 17: Conceptual model of leadership styles required to enhance big data decision-making capability (with research questions)

6.4. Research question 1 – transformational leadership

6.4.1 Transformational leader to inspire a vision and unite all to become data-driven

The first theme that was identified under transformational leadership had two parts, the first being to inspire the vision and the second to unite the team to become data-driven. This first theme has been placed on the right of the main triangle in Figure 17 to illustrate which areas it affects and also its importance. The first part of the theme corresponds to the long-term goal orientation of a transformational leader (Judge & Piccolo, 2004). The inspirational motivation dimension of transformational leadership has been associated with painting the vision of the future. This aligns with the arguments of Anderson and Sun (2017), together with Judge and Piccolo (2004), when they explain the inspirational motivation dimension of transformational leadership. The leaders emphasised the setting of an unconstrained vision, especially stipulating that the vision must not be limited by what is possible today. Although this corresponds to the challenging of followers to aspire to higher standards that were addressed by Anderson and Sun (2017) when they discuss the inspirational motivation dimension of transformational leadership, there is a resemblance to a constrained vision in that definition because it needs to follow a standard. It is necessary to note that the vision should not only aspire to higher standards, but in addition aim for an unrestricted vision when it comes to big data. Judge and Piccolo (2004) did have some resemblance to a certain extent considered this unconstrained vision when they discussed the intellectual stimulation dimension and referred to challenging assumptions and taking risks.

The second part of the theme that was identified under transformational leadership is the necessity to unite the team in becoming more data-driven. The charisma dimension of transformational leadership indicates that a charismatic leader behaves in an admirable way to encourage the team to follow (Judge & Piccolo, 2004). The appealing strategic vision aspects that Conger and Kanungo (1994) discussed under charismatic leadership supports the uniting of the team around the big data vision. The leaders did caution that the inspirational part, and not the charismatic characteristics, was the most important. Pasternack and Toole (2002) also pointed out that charisma is not essential for the leader's success, and they argued for pragmatic leadership instead of charismatic leadership. When coming back to the dimensions of transformational leadership, looking at the socialised charismatic leader characteristics of empowering and developing the team and striving for the vision that is optimal for the collective (Conger, 1999), some of the reasons that the leaders were concerned about regarding charismatic leadership are addressed. Such a socialised charismatic leader will challenge the team and paint the picture of the future that is appealing to all. The charisma dimension is not the most important, but it plays an important role in getting the team united

behind the big data vision. The charisma dimension was therefore added under the visionary triangle at the top of the conceptual model in Figure 17.

Although the combination of the inspirational motivation and charisma dimensions of transformational leadership to set a vision and unite the team is important right through the big data journey, it plays a more critical role at the start of the journey. The importance of this phase in the journey will be discussed in section 6.7.1. The dimensions of the transformational leadership styles required to sustain the benefit after the initial phase will be discussed next.

6.4.2 Transformational leader with intellectual stimulation and individualised consideration for a sustainable benefit

To ensure the benefit from big data is sustained, the intellectual stimulation and individualised consideration dimension of transformational leadership has to be employed. The leaders indicated that data scientists had to be stimulated all the time to make sure they stayed committed to the big data vision. Judge and Piccolo (2004) addressed this with the intellectual stimulation dimension of transformation leadership when they mentioned that such a leader challenges assumption about the data and the business, and encourage the data teams to take risks. Judge and Piccolo (2004) also advised that the leader should support ideas from the followers in the data teams and encourage their creativity. The leaders confirmed that the intellectual stimulation dimension was where the real work happened and that is why the rectangle block for this dimension touches sides with the execution, creative, relational and community-orientated areas in the conceptual model (Figure 17).

The individualised consideration dimension of transformational leadership has also been indicated to ensure sustainability. The leaders recommended that this dimension should be used to mentor and coach the team about big data and about the strategy of the business. Judge and Piccolo (2004) also referred to the leader becoming a coach and a mentor when focusing on individual needs. The leaders also felt that the leader must use this dimension to ensure that the business focuses on the individual needs of their customers. Although this is not explicitly mentioned in the literature reviewed, there is a resemblance of a leader coaching followers to focus on customer needs. Further exploration can be done with regard to customer centricity and the individualised consideration dimension of transformational leadership. In terms of this research, the leader can use individualised consideration to make sure the data scientists are educated about the business, and the entire team is educated about the value of big data for the business.

The leaders felt that execution is not only transactional, and the dimensions of transformational leadership are beneficial during execution as well. Judge and Piccolo (2004) submitted that a

leader uses the inspirational motivation dimension to communicate enthusiastically about future goals and provide meaning for the execution. There is also other aspects of transformational leadership that Judge and Piccolo (2004) alluded to that could be beneficial for the execution of a big data strategy, such as the sensitivity to risks and the consideration of ecosystem risks. For this reason, transformational leadership has also been added to the execution triangle in the middle of the conceptual model (Figure 17).

6.5. Research question 2 – transactional leadership

6.5.1 A transactional leader needed for strategic execution

The predominant feedback from the leaders that transactional leadership was required for the execution of the big data strategy is supported by Judge and Piccolo (2004) when they refer to the transaction of proper resources to get work done. Podsakoff et al. (2006) also found a correlation between the overall performance of the team and the use of transactional leadership. Transactional leadership was thus also added to the execution triangle in the middle of the conceptual model (Figure 17).

There has been a difference of opinion on the use of transactional leadership to ensure the integrity of that data among the leaders. Some supported it with a view to improve the integrity of the data. In the literature, a reference to this can be found in the comments of Judge and Piccolo (2004) and the management of exceptions if transactions do not result in the desired outcome. Other leaders said that if the leader has a transactional style, the data will be manipulated, and integrity will be lost. Podsakoff et al. (2006) explored a similar concept when the use of contingent reward and non-contingent punishment correlated to improve workplace performance. The observation is made that the balance between the use of transformational and transactional leadership is important when ensuring data integrity.

The reference to the increased importance of transactional leadership when executing strategy with the remote working arrangement changes and increased possibility to do modular tasks due to COVID-19 will need to be further explored and will be discussed in section 7.5.

The leaders encouraged the contingent reward dimension of transactional leadership to motivate the team to follow the vision. Judge and Piccolo (2004) intimated to this when they described contingent reward as the setting up of positive interaction to motivate followers to do what is required. Judge and Piccolo (2004) also mentioned that the transactional leader would clarify the expectations and the rewards for reaching those expectations. The leaders also pointed to this when they mentioned that it was important to have a well-designed

contingent reward system to clarify expectations and rewards. The effect of contingent reward on these expectations between the leaders and followers has been explored by Goodwin et al. (2001), who indicated that it affects the implicit and explicit psychological contract between the leaders and followers. This is in agreement with the importance that the leaders attributed to it during the interviews. Goodwin et al. (2001) also indicated that the implicit phycological contracts are associated with transformational leadership, which further motivates the adding of both transformational and transactional leadership to the central management triangle in the conceptual model (Figure 17). The contingent reward dimension has also been added to the central execution triangle of the conceptual model.

6.5.2 A transactional leader must balance active and passive MBE

The leaders indicated that active and passive management by exception (MBE) should be balanced in order to optimise the transactional leadership role in enhancing big data decision-making capability. Judge and Piccolo (2004) detailed that leaders can respond in two different ways to correct outcomes and that their effects would be different. The balance between the active and passive MBE has not been explored in the literature that was reviewed. The summary of the interviews indicated that executive leaders should stay involved in the strategic operations of their business but not disempower the managers by being too active with exception management. Leaders must also not be too passive, because exceptions need to be attended to quickly to optimise the effect on the downstream links in the big data chain. The additional exploration of what the optimal balance should be between active and passive MBE will be added to areas for future research detailed in section 7.5.

Active and passive MBE were added to the central management area of the conceptual model (Figure 17). The effective combination of these two different approaches must be used to manage all the areas that touch sides with this management area. In other words, leaders should apply an appropriate combination of active and passive MBE when focusing on the execution of the visionary, creative and relational areas. All these areas need execution, especially visionary, otherwise results will not be obtained. Management skills to execute will be further discussed in section 6.6.1.

6.6. Research question 3 – leadership self-identities

The way in which leaders can use their dynamic capabilities and change between the five leadership self-identities based on the context (Anderson & Sun, 2017), was found to be applicable when looking at how leadership behaviour can enhance big data decision-making capability. Because of this observation, the main areas in the conceptual model (Figure 17)

were given labels that indicate the five leadership self-identities. The other leadership styles were then integrated into these areas, as discussed in the previous sections.

6.6.1 Strong visionary leader with a fine balance of management skills to execute

As with the inspirational motivation and charisma dimensions of transformational leadership, the visionary leadership self-identity was regarded as essential for painting a picture of the future where big data enhance the quality of decisions. Anderson and Sun (2017) defined a leader with the visionary self-identity as a futurist that understands where the organisation is going and is able to sell the vision to the followers. This corresponds to the comments from the leaders interviewed, that the leader must be able to align the organisation's roadmap to being more data-driven. The call for the practicality of the roadmap link to the manager leadership self-identity. Leaders exhibiting the manager self-identity see themselves as being able to get the work done (Anderson & Sun, 2017). These leaders with the manager leadership self-identity often use the contingent rewardas detailed in the transactional leadership section.

The leaders were of the opinion that executive leaders should not get involved in management decisions but rather set up governance systems to support the lower-level leaders to manage efficiently. This was supported by Anderson and Sun (2017) when they referred to the important role of structure and systems for a leader with the management leadership self-identity; such leaders use these structures and systems to control the outcomes (Anderson & Sun, 2017).

As regards the visionary and manager (execution) leadership self-identities forming the top two triangles of the conceptual model (Figure 17), this type of leader can orchestrate the resources to become valuable, rare, imperfectly imitable and non-substitutable, allowing the organisation to obtain a competitive advantage as explained by Gupta and George (2016) as well as Janssen et al. (2017). The other areas in the model touching sides with the execution area support this orchestrating of the resources.

6.6.2 The role of a relational, creative, and community-orientated leader

The leaders emphasised the importance of relationships to support the vision. Anderson and Sun (2017) described the relational leadership self-identity as that of a leader who focuses on creating positive relationships with his or her team members. Leaders with the relational self-identity possess attributes needed to build strong relationships with followers, such as being ethical, authentic and transparent. Having strong relations will support the leader's dynamic capability when resources need to be integrated and reconfigured to utilise big data in order to compete and influence dynamic markets. The necessity to apply dynamic capabilities to big

data driven decisions in dynamic markets has been described by Shamim et al. (2019) as well as Gupta and George (2016). For this reason, in the conceptual model (Figure 17), the relational triangle is depicted with the individualised consideration dimension of transformational leadership integrated into it.

Establishing a creative culture to enhance the problem-solving options from big data has been highlighted by the leaders. Anderson and Sun (2017) list creative problem solving as a characteristic of a leader with the creative self-identity, stating that they approach old problems in new ways. Anderson and Sun (2017) also explicitly mention intellectual stimulation when they discuss the creative leadership self-identity. For this reason, the intellectual stimulation rectangle overlaps with the creative triangle in the conceptual model (Figure 17). There was a concern raised during the interviews that executive leaders should not be too creative because it will limit their bandwidth to attend to other important factors; the execution triangle next to the creative triangle can assist with this balance.

The leaders indicated that the community-orientated leadership self-identity holds the future value for organisations and for society. Sun and Anderson (2012) described this as always serving the greater public, because leaders with a community-orientated self-identity see themselves as a member of the community. The advantages of being community-orientated have been so profound that this aspect has been added as the base of the pyramid shown in the conceptual model (Figure 17). All leadership styles should rest on this foundation of serving the society and, as mentioned by one of the leaders, ultimately building the organisational brand around a partner in society using big data skills to serve the community.

6.6.3 Discussion on the leadership self-identity concept

The feedback that was given on the leadership self-identities will be briefly discussed to support this new concept. This discussion on the leaders' feedback aims to support any further development of the concept.

Although there were recommendations to add aspects to the leadership identities, the researcher did not see the need to add any self-identities to the concept. These recommendations were helpful in the understanding of the influence leaders' behaviour has on big data decision-making capability, but there was no need to change the concept as explained by Anderson and Sun (2017). The comment on mindset or mindfulness that was made can be interpreted to be part of the relational self-identity, and all the aspects are reflected there already. The suggestion that intellectual understanding was required has been covered by the explicit comment by Anderson and Sun (2017) that leaders with the creative self-identity are seen as being intellectually stimulating.

There could be a consideration to renaming the manager self-identity to ‘executer’, or something similar. This recommendation is given due to the alternative perception of the word ‘manager’. Some participants did mention that the word ‘manager’ is associated with micromanagement and other less optimal ways to lead during execution.

The comment to arrange the leadership self-identities into a pyramid inspired the development of the conceptual model (Figure 17) in the form of a pyramid with the leadership self-identities as the labels on the triangles. The visionary self-identities was placed at the top to give guidance to the rest that supports each other. The community-orientated self-identity was positioned as the foundation. The leadership self-identities do form an excellent platform to build a new ‘full-range’ model for leadership behaviour, as Anderson and Sun (2017) suggested.

6.7. Research question 4 – contextual leadership

Contextual leadership builds on the leadership self-identities where the leader can adjust behaviours based on what is required for the context. The leaders commented right throughout the interviews that leadership behaviours needed to adjust to the context. The omnibus and discrete levels of the context (Oc, 2018) will be used in this discussion. These two levels and the sublevels that will be referred to are displayed in Figure 1.

6.7.1 Adjust leadership style to where you are in the big data journey or what the context requires

The first theme refers to the adjusting of leadership style according to where leaders are in the big data journey and what the context requires. That does talk to the ‘where?’ and ‘when?’ on the omnibus level and the ‘task’ characteristics on the discrete side of Figure 1 (Oc, 2018). The ‘where?’ has been added, because using big data for decision making will affect the culture and type of organisation because, as the leaders mentioned, using big data for decisions changes the mood in the organisation and will ultimately also affect the culture to be more data-driven. When the data starts affecting the business model of the organisation, the type of organisation will also change. Oc (2018) listed the type of organisation and culture under the ‘where?’ sublevel of his framework that links context to leadership behaviour. The ‘when?’ sublevel was used by the leaders when they remarked that where you are in the journey to becoming more data-driven is important when determining what leadership style to use. Oc (2018) mentioned organisational change under the ‘when?’ sublevel and stated that becoming more data-driven does cause an organisational change. The ‘task’ sublevel was identified because the leaders referred to the characteristics of their tasks, and specifically the

difference between setting a vision andneeding to get the work done. This is where the leaders motivated for using both transformational and transactional leadership, and it became part of the motivation for adding both styles to the centre execution triangle in the conceptual model (Figure 17).

The leaders also suggested that leadership style needs to be adjusted to the specific follower, and that relates to the 'who?' sublevel on the omnibus side and the 'social' sublevel on the discrete side of Figure 1 (Oc, 2018). The 'who?' area includes gender and demographics that are important characteristics that need to be considered. Johns (2006) also included occupation and the capabilities of the actors in the leadership process when exploring the 'who?' dimension. The capabilities of the followers are important, as indicated by the comment of the leaders interviewed that the leader's behaviour must be adjusted to the capabilities of the specific person. This relates to the individualised consideration dimension of transformational leadership and the relational leadership self-identity.

This discussion on how contextual leadership can be used to influence big data decision-making capability does indicate that the leader needs to be able to change between the different styles and thus move between the different blocks in the conceptual model (Figure 17). No addition has been made to the conceptual model based on the contextual leadership discussion, except that the leader needs to develop the skill to move between the different areas. This insight has been added to the bottom of the main triangle to illustrate the importance, with the other insights on the other sides.

6.7.2 Executive commitment to data-driven decisions and leadership style to support

Through their feedback, the leaders made it clear that the executive leadership has to be committed to the data-driven decisions and the concept of seeing data as a scarce resource that needs to be dynamically adjusted to the market demands. This argument to view data as a scarce resource in the resource-based view (Barney, 1991) has been elaborated on in section 6.2.2.

The necessity to have the courage to start the big data journey is supported by the combination of the visionary, manager and creative leadership self-identities and all the other leadership dimensions discussed and incorporated into the conceptual model (Figure 17) up to now. For example, the willingness to challenge the status quo and to learn is supported by the visionary leadership self-identity when Anderson and Sun (2017) refer to such a leader challenging the old ways of doing things with creative problem-solving. The visionary leader will create the spark and intellectual motivation to start this process, and the manager will guide the execution.

Pragmatic leadership (Mumford & Van Doorn, 2001) has been identified as a centre point through the feedback on how to align the leadership behaviour to this scarce resource called big data. The in-depth knowledge of the business and extensive knowledge about the social aspects of the organisation referred to by Anderson and Sun (2017) as characteristics of a pragmatic leader, support the need for developing a common language and data-driven culture. The hands-on leadership that was discussed by one leader can also be incorporated into pragmatic leadership. Pasternack and Toole (2002) alluded to this when they typified pragmatic leaders are problem-orientated and suitable for implementing new strategies. Antonakis and House (2014) incorporated pragmatic leadership into transformational leadership and labelled this added dimension as instrumental leadership. The instrumental part does relate to hands-on leadership, as presented by the leader interviewed. Mumford et al. (2008) argued that the pragmatic leader is not predominantly driven by the vision, but rather by solving problems and achieving short term goals, which also relates to the concept of hands-on leadership. Pragmatic leadership has been added to the centre execution triangle of the conceptual model (Figure 17) because of its important role in the execution of the big data strategy.

The need to be analytical or to ensure that someone in the leadership team is analytical also refers to pragmatic leadership. Anderson and Sun (2017) specifically mention critical thinking when they discuss pragmatic leadership. The other pragmatic leadership characteristics discussed in the previous paragraph also support the need to be analytic about the business and the big data analysis. The leaders also emphasised that the executive leader needs to be able to ask the right questions to prompt the team to solve the right problems and to get appropriate answers. Pragmatic leadership combined with intellectual stimulation can be used to guide the leader in asking the right questions.

The necessity of encouraging experimentation with the data and the business models could be supported by the creative leadership self-identity and the specific triangle in the conceptual model (Figure 17). As indicated by the model, inspirational motivation and intellectual stimulation can be used to link experimentation to the rest of the areas.

The discussion in this section highlighted the need for pragmatic leaders in the centre execution triangle of the conceptual model to interface with, enhance and control the other areas. Next, the focus on strategy will be discussed.

6.7.3 Strategy drives leadership style

In their feedback, the leaders indicated that the organisation’s main strategy should drive the digital and data strategies. Big data should be used as a tool to influence the aspects of the

business that will create the greatest benefit. As stated in section 5.6.3, this concept is the essence of strategy theories and will not be discussed in detail in this section, but it is still crucial to the discussion of the appropriate leadership styles and behaviours.

An important insight was that the fact that using big data does not override the need for a leader to lead optimally; big data is only used as a tool assist leaders in their task. However, the need to optimise the selection of leadership styles and behaviours to enhance this tool called big data remains. Many organisations promote the use of transformational leadership style and discourage transactional leadership style. Through the feedback from the leaders and the discussion on the feedback, it was clear that a blend of the leadership styles is required, as indicated in the conceptual model (Figure 17). When a leader actively works on improving his or her dynamic capabilities (Teece, 2018) to shift between the leadership styles and dimensions discussed, the potential benefit of using big data as a decision-making tool can be fully harnessed.

6.8. Conclusion

Through this discussion, the conceptual model for the leadership styles required to enhance big data decision-making capability has been discussed and defended. The ability to shift between the leadership styles and dimensions of leadership to deliver optimally on the requirements set by the leaders to enhance big data decision-making capabilities has been discussed. The conclusion and recommendations for further studies will be discussed in the next chapter.

7. Conclusions and Recommendations

7.1. Introduction

In this final chapter, the conclusion of this research will be presented. The principal conclusions will be discussed first, followed by the implications for management. The research limitations will also be discussed, and finally, suggestions will be made for future research to enrich the literature on various topics.

7.2. Principal conclusions

7.2.1 Practitioners' view on big data and their influence on big data decision-making capability

There is no homogenous definition of big data in the literature (Shamim et al., 2019), and thus the definition of big data will be expanded on to facilitate the understanding hereof. Big data is the proliferation of data from various sources because everything is connected, and this contributes to a rich data trail of customer behaviours and needs, machinery or processes. The data trail includes data from business intelligence (BI) systems and machinery. The proliferation of data means that data is generated in high-volumes, at high-velocity and with high-variety. The practitioners did see a significant benefit for many industries obtained by using big data to enhance their decisions and operations, and this is not only limited to digitally-born organisations.

The participants interviewed confirmed that big data is considered to be as a valuable, rare, imperfectly imitable, and non-substitutable (VRIN) resource for the organisation (Gupta & George, 2016; Janssen et al., 2017). This VRIN resource provides a source of competitive advantage, as described in the resource-based view (Barney, 1991). The participants also confirmed that data being a VRIN resource was not sufficient on its own; that leaders play a vital role in the orchestration of several resources to enable their dynamic capabilities and enhance the organisation's big data decision-making capabilities (Gupta & George, 2016; Shamim et al., 2019). The conclusion from this research is that leadership style does influence big data decision-making capabilities, and that there is not a single style that is optimal, leaders rather have to dynamically shift between the styles as determined by the context.

7.2.2 Conceptual model for leadership styles required to enhance decision-making

A conceptual model has been developed to assist leaders to use the required leadership style to enhance big data decision-making capability. This conceptual model has been displayed in

Figure 18 below. The three leadership styles that have been investigated were transformational, transactional and pragmatic leadership (Anderson & Sun, 2017). These were then supplemented with literature that defines how contextual factors shape these leadership behaviours, encompassing leadership self-identities and contextual leadership (Anderson & Sun, 2017; Oc, 2018). Aspects of all these leadership theories have been built into the model. The leadership self-identities have been used as labels for the triangles and aspects of the other leadership styles are presented with stars in front. The centre triangle has been relabelled as execution, considering the feedback from the leaders interviewed that the word 'manager' has the negative connotation of micromanagement and other less commendable management traits. Each one of the main conclusions depicted on the sides of the conceptual model will be discussed next.

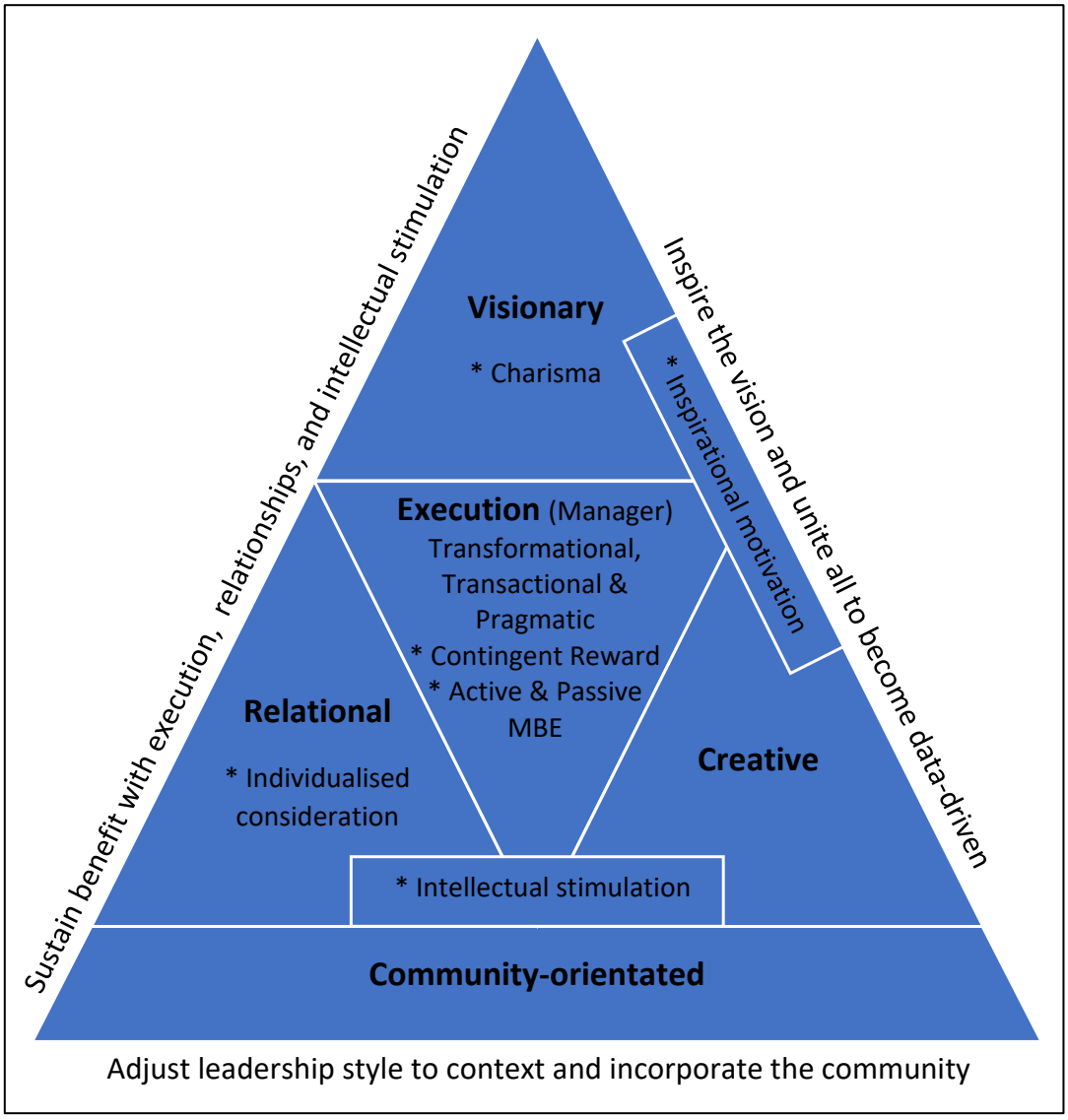

Figure 18: Conceptual model of leadership styles required to enhance big data decision-making capability

7.2.3 Inspire the vision and unite all to become data-driven

A visionary leader must paint an unconstrained picture of a future that in which big data driven decisions are used and then unite the team to become data-driven. To facilitate the painting of the future vision, the leader can rely on a combination of the inspirational motivation dimension of transformational leadership (Judge & Piccolo, 2004), as well as the visionary and creative leadership self-identity (Anderson & Sun, 2017). These three areas of leadership behaviours that can be used effectively are shown in the top and right-hand side triangles and the rectangle in between on the conceptual model presented in Figure 18. The leaders should perceive themselves as futurists and articulate the vision of being big data driven in a way that is appealing and inspiring to the team members. Optimism about the future goal of being data-driven must be communicated, and team members should understand how that adds meaning to their daily tasks. The leader should challenge assumptions and encourage creative problem solving while encouraging experimentation with the data and business models.

The charisma dimension of transformational leadership can be advantageously employed by leaders in uniting the team to become data-driven (Judge & Piccolo, 2004). Using this dimension, the leader must act in an inspiring manner to encourage the team members to identify with him or her and aspire to the vision of becoming data-driven. Although the charisma dimension is not the most important and might fade away when the execution get tough, the leader should back it up with inspirational motivation and visionary behaviour, as explained in the previous paragraph.

7.2.4 Sustain benefit with execution, relationships and intellectual stimulation

The vision and the united team should be constantly supported by execution, relationships, and intellectual stimulation. The new blend of each of these subcategories is discussed below.

<u>Execution</u>

For execution support, the manager leadership self-identity is predominantly used, with an additional blend of the transformational, transactional and pragmatic leadership styles. This is illustrated in the execution triangle the centre of the conceptual model (Figure 18). All three transactional leadership dimensions are useful in this management triangle: contingent reward, and active and passive management by exception (MBE). It is important to realise that execution is not only transactional, and therefore, transformational leadership was added to this central execution triangle. When all these styles are blended with the manager self-identity for executing a big data strategy, leaders should effectively manage the team by being well organised, task-orientated and focusing on outcomes that are aligned with the strategy to

become data-driven. The leader should be analytical in approaching problems and analysing the data. A well-designed contingent reward system to influence the data-driven culture and set the expectations has to be in place and implemented. An adequate balance between the active and passive management by exception (MBE) approaches must be used, adjusted to every specific team member. The leader should motivate the team by communicating enthusiastically about future goals and provide meaning for the execution thereof. The leader's in-depth knowledge of the business and extensive knowledge about the social aspects of the organisation should strengthen the connections to all the other areas in the conceptual model.

Relationships

Furthermore, sustainability is also supported by the leader's attention to relationships and individualised consideration. The relational leadership self-identity (Anderson & Sun, 2017) and the individualised consideration dimension of transformational leadership (Judge & Piccolo, 2004) are blended to support the description of this area. The leader must be authentic, demonstrate ethical behaviour and emphasise transparency. While focusing on the need of others, the leader has to act as a coach and a mentor. He or she further has to ensure that all team members are data literate and there is a common language describing how the value of the data will assist the relationships to support the strategy. Having strong relationships will support the leader's dynamic capability when resources need to be integrated and reconfigured to utilise big data to compete in and influence dynamic markets.

Intellectual stimulation

The intellectual stimulation of the team, especially the data scientists, is an important bridge between execution, creativity, and relationships. The linking of these areas is where the real work has to be done by keeping everyone stimulated through creativity when they are executing. Leaders should support ideas from team members and encourage their creativity. The assumptions around the business model and data should be challenged and the leaders must be willing to take risks.

7.2.5 Adjust leadership style to context and incorporate the community

Contextual leadership describes how a suitable blend of the leader's behaviour can change, depending on the context or the specific team member (Oc, 2018). This research suggests that leaders should develop their ability to dynamically shift between the blend of leadership styles and behaviour, as demonstrated in the conceptual model (Figure 18), depending on where they are in terms of their big data journey and the individuals in their teams. Anderson and Sun (2017) proposed the five leadership self-identities used for the main triangles and the base of the conceptual model as a socio-cognitive approach when explaining how leaders can

behave in a different manner, depending on the situational context. In this research, the leadership styles and behaviours to enhance big data decision making has been integrated into this concept of leadership self-identities.

The adjusting of leadership styles to optimise the outcome should rest on the foundation of serving the community. Using data skills to serve the community does hold future value for the organisation. This value originates from several different aspects, from using big data capabilities to serve the community's needs, to making sure eco-system risks are monitored by using big data. For example, the community's needs can served by using big data skills to process the backlog of COVID-19 tests for the government, as one of the leaders who were interviewed did, and with that initiative provided temporary employment and skills development to many unemployed people. A second example of the value for the organisation is that the leader can be community focused by using big data to determine risks in the organisation's eco-system and in this way add value to the community and the organisation by preventing those risks or sharing the insights into the data with community members.

7.3. Implications for management and other relevant stakeholders

This research identified two implications for management and other relevant stakeholders.

7.3.1 Do not promote a single leadership style

The first implication for management was that they should not encourage a single leadership style, like transformational leadership, or discourage transactional leadership, but rather acknowledge that a blend of leadership styles was required to enhance big data decision-making capability. Hannah et al. (2014) supported this and argued that the need to have the ability to change leadership behaviours based on the situation, invalidated the need for predefined leadership styles. Management needed to develop the dynamic capabilities of their leadership teams to be able to recognise which area in the conceptual model shown in Figure 18 was required or which areas needed to be combined to direct the situation optimally to benefit from big data in their organisations.

7.3.2 Urge to start aligning leadership behaviour to get benefit from big data

The use of big data has a proven track record of having an impact on the competitive advantage of an organisation (Gendron et al., 2014; Mikalef et al., 2020; Pigni et al., 2016; Wamba et al., 2017). For example, big data plays an important role in industry 4.0, the German developed plan for the fourth industrial revolution (Shamim et al., 2019), and leaders need to

start paying attention to building their big data specific capabilities (Shamim et al., 2019). Leaders can create and extract value from big data by enhancing their organisation's decision-making capabilities (Janssen et al., 2017; Mikalef et al., 2020; Zeng & Glaister, 2018). The critical role of the leader in orchestrating the resources has been highlighted by Shamim et al. (2019). Gupta and George (2016) indicated that advantages that could be gained from the use of big data would be missed if the leadership team did not recognise those benefits. The insight for leaders from this research is that they should not be stuck in the world of business intelligence, and machine data, and miss all the benefits that big data could add to their business. Leaders need to start dreaming big where data-driven decisions are concerned, and have the courage to take the first step or increase their pace of big data adoption. The conceptual model developed during this research can be used to guide leadership behaviour when taking these steps.

7.4. Limitations of the research

The limitation with regard to methodology has been discussed in Section 4.11. However, two additional general limitations were identified and will be discussed below.

7.4.1 Leadership style applicability to other areas

Although the conceptual model developed for the leadership styles required to enhance big data decision-making capability might apply to other non big data fields, this generalisation cannot be supported because the research questions were directly aimed at improving the orchestration of the links in the data chain. The blend suggested in the conceptual model has been developed from the comments of participants on questions that were framed specifically for big data and data-driven concepts. Further research on this will be discussed in section 7.5.1.

7.4.2 Need to expand on contextual leadership

Contextual leadership has been a popular field for research in recent days (Oc, 2018), thus there is a wide variety of literature available on the topic. For this research only a limited corpus literature has been reviewed and this is a limitation to the findings. At the start of the research contextual leadership were not identified as significantly important, thus the research question did not have extensive depth on this concept in the interview guide. The participants all elaborated on the concept and more structure could have been provided if the literature reviewed on contextual leadership before the interviews had been more extensive.

7.5. Suggestions for future research

7.5.1 Applicability of the conceptual model to other areas

The conceptual model in Figure 18 is specifically focused on the leadership styles required to enhance big data decision-making capability; it might be applicable to other areas where a blend of leadership styles is required, though. Future research should focus on gaining deeper insight into the applicability and limitations of this conceptual model to a more general field of leadership that is not only focused on big data. Several other organisations could also benefit from insights gained by this conceptual model.

7.5.2 Leadership self-identities

The leadership self-identities form an excellent platform to build a new 'full-range' model for leadership behaviour, as Anderson and Sun (2017) suggested. The concept has not been extensively researched yet and future research should build on this body of knowledge to improve the understanding of leadership behaviour.

7.5.3 Enhancing customer centricity with big data supported by the individualised consideration dimension of transformational leadership

Participants interviewed identified the benefit of using the individualised consideration dimension of transformational leadership to ensure that big data was serving the individual customer's needs and that decisions were customer centric. Future research could focus on specifically how individualised consideration could enhance the value of big data by paying attention to the individual customer's needs.

7.5.4 COVID-19 effect on leadership styles

With COVID-19 effecting the remote working habits and capabilities of employees and followers in many industries, followers are now able to do more free-lance work where they can complete smaller units of work for leaders and then move on to a leader in another organisation. These leadership interactions tend to be more transactional because of the defined deliverables and short-term focus of the engagement. COVID-19 could also have

affected other aspects of the appropriate leadership style for different applications. Future research should be done to explore the effect of COVID-19 on leadership styles.

7.5.5 Balance between active and passive MBE to enhance big data decision-making capability

Future research should focus on the optimal balance between the active and passive management by exception (MBE) dimensions of transactional leadership to enhance big data decision making capability. This research suggested that executive leaders needed to stay involved in the strategic operations of their business but not disempower the managers by being too active with reference to exception management. Leaders must also not be too passive, because exceptions needed to be attended to quickly to optimise or neutralise the effect on the downstream links in the big data chain. Future research to explore how this balance can be reached would be beneficial to leaders that strive to optimise their big data decision-making capability.

8. References

Abbasi, A., Sarker, S., & Chiang, R. H. L. (2016). Big data research in information systems: Toward an inclusive research agenda. *Journal of the Association for Information Systems*, *17*(2), 1–32. https://doi.org/10.17705/1jais.00423

Agee, J. (2009). Developing qualitative research questions: A reflective process. *International Journal of Qualitative Studies in Education*, *22*(4), 431–447. https://doi.org/10.1080/09518390902736512

Akhtar, P., Frynas, J. G., Mellahi, K., & Ullah, S. (2019). Big Data-Savvy Teams' Skills, Big Data-Driven Actions and Business Performance. *British Journal of Management*, *30*(2), 252–271. https://doi.org/10.1111/1467-8551.12333

Akoka, J., Comyn-Wattiau, I., & Laoufi, N. (2017). Research on Big Data – A systematic mapping study. *Computer Standards and Interfaces*, *54*(January 2017), 105–115. https://doi.org/10.1016/j.csi.2017.01.004

Alvesson, M., & Deetz, S. (2000). *Doing critical management research*. Sage.

Amit, R., & Schoemaker, P. J. H. (1993). Strategic Assets and Organizational Rent. *Strategic Management Journal*, *14*, 33–46.

Anderson, M. H., & Sun, P. Y. T. (2017). Reviewing Leadership Styles: Overlaps and the Need for a New 'Full-Range' Theory. *International Journal of Management Reviews*, *19*(1), 76–96. https://doi.org/10.1111/ijmr.12082

Antonakis, J., & House, R. J. (2014). Instrumental leadership: Measurement and extension of transformational–transactional leadership theory. *The Leadership Quarterly*, *25*(4), 746–771.

Barney, J. (1991). Firm Resources and Sustained Competitive Advantage. *Journal of Management*, *17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Bass, B. M., & Steidlmeier, P. (1999). Ethics, character, and authentic transformational leadership behavior. *The Leadership Quarterly*, *10*(2), 181–217. https://doi.org/10.1016/S1048-9843(99)00016-8

Batistič, S., & van der Laken, P. (2019). History, Evolution and Future of Big Data and Analytics: A Bibliometric Analysis of Its Relationship to Performance in Organizations. *British Journal of Management*, *30*(2), 229–251. https://doi.org/10.1111/1467-8551.12340

Beyer, M. A., & Laney, D. (2012). The importance of "Big Data": a definition. *Gartner*, *G00235055*. https://doi.org/10.1016/j.mprp.2019.05.003

Birkinshaw, J., Brannen, M. Y., & Tung, R. L. (2011). From a distance and generalizable to up close and grounded: Reclaiming a place for qualitative methods in international business research. *Journal of International Business Studies*, *42*(5), 573–581.

https://doi.org/10.1057/jibs.2011.19

Bizer, C., Boncz, P., Brodie, M. L., & Erling, O. (2012). The Meaningful Use of Big Data: Four Perspectives-Four Challenges. *ACM Sigmod Record*, *40*(4), 56–60.

Bloomberg, L. D., & Volpe, M. (2019). *Completing your qualitative dissertation: A road map from beginning to end* (4th ed.). Sage Publications.

Bowen, G. A. (2010). From Qualitative Dissertation to Quality Articles: Seven Lessons Learned. *The Qualitative Report*, *15*(4), 864–879.

Brown, M. E., & Treviño, L. K. (2006). Ethical leadership: A review and future directions. *Leadership Quarterly*, *17*(6), 595–616. https://doi.org/10.1016/j.leaqua.2006.10.004

Brynjolfsson, E., & McElheran, K. (2016). The rapid adoption of data-driven decision-making. *American Economic Review*, *106*(5), 133–139. https://doi.org/http://dx.doi.org/10.1257/aer.p20161016

Cassell, C., & Symon, G. (2011). Assessing “good” qualitative research in the work psychology field: A narrative analysis. *Journal of Occupational and Organizational Psychology*, *84*(4), 633–650. https://doi.org/10.1111/j.2044-8325.2011.02009.x

Chartier, T. (2016). Seven V’s of Big Data understanding Big Data to extract value. *Journal of Corporate Accounting & Finance*, 11–15. https://doi.org/10.1002/jcaf

Chen, H., Chiang, R. H. L., & Storey, V. C. (2012). Business Intelligence and Analytics-From Big Data to Big impact. *MIS Quarterly*, *36*(4), 1165–1188.

Conger, J. A. (1999). Charismatic and transformational leadership in organizations: An insider’s perspective on these developing streams of research. *The Leadership Quarterly*, *10*(2), 145–179. https://doi.org/10.1016/S1048-9843(99)00012-0

Conger, J. A., & Kanungo, R. N. (1994). Charismatic leadership in organizations: Perceived behavioral attributes and their measurement. *Journal of Organizational Behavior*, *15*(5), 439–452. https://doi.org/10.1002/job.4030150508

Cooper, D., & Thatcher, S. (2010). Identification in organizations: The role of self-concept orientations and identification motives. *Academy of Management Review*, *35*(4), 516–538. https://doi.org/10.5465/AMR.2010.53502693

Creswell, J. W., & Miller, D. L. (2000). Determining validity in qualitative inquiry. *Theory into Practice*, *39*(3), 124–130. https://doi.org/10.1207/s15430421tip3903_2.

Denscombe, M. (2014). *The good research guide: for small-scale social research projects* (Fourth Edi). UK: McGraw-Hill Education.

Du Toit, G. S., Erasmus, B. J., & Strydom, J. W. (2009). improved Definition of a small business. In *Introduction to business management* (7th ed., p. 49). Oxford University Press.

Fiol, C. M., Harris, D., & House, R. (1999). Charismatic leadership: Strategies for effecting social change. *The Leadership Quarterly*, *10*(3), 449–482.

Gendron, M., Yeoh, W., & Swarr, R. (2014). Supporting decision making: The BI sweet spot. *Decision Support Systems*, *261*, 279–290. https://doi.org/10.3233/978-1-61499-399-5-279

Ghaeini, H. R., Antonioli, D., Brasser, F., Sadeghi, A. R., & Tippenhauer, N. O. (2018). State-aware anomaly detection for industrial control systems. *Proceedings of the ACM Symposium on Applied Computing*, 1620–1628. https://doi.org/10.1145/3167132.3167305

Goodwin, V. L., Wofford, J. C., & Whittington, J. L. (2001). A theoretical and empirical extension to the transformational leadership construct. *Journal of Organizational Behavior*, *22*(7), 759–774. https://doi.org/10.1002/job.111

Guest, G., Bunce, A., & Johnson, L. (2006). How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. *Field Methods*, *18*(1), 59–82. https://doi.org/10.1177/1525822X05279903

Gupta, M., & George, J. F. (2016). Toward the development of a big data analytics capability. *Information and Management*, *53*(8), 1049–1064. https://doi.org/10.1016/j.im.2016.07.004

Hannah, S. T., Sumanth, J. J., Lester, P., & Cavarretta, F. (2014). Debunking the false dichotomy of leadership idealism and pragmatism: Critical evaluation and support of newer genre leadership theories. *Journal of Organizational Behavior*, *35*(5), 598–621. https://doi.org/10.1002/job.1931

Howell, J. M., & Shamir, B. (2005). The role of followers in the charismatic leadership process: Relationships and their consequences. *Academy of Management Review*, *30*(1), 96–112. https://doi.org/10.5465/AMR.2005.15281435

Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, *15*(9), 1277–1288. https://doi.org/10.1177/1049732305276687

Hwang, S. (2008). Utilizing qualitative data analysis software: A review of Atlas.ti. *Social Science Computer Review*, *26*(4), 519–527. https://doi.org/10.1177/0894439307312485

Janssen, M., van der Voort, H., & Wahyudi, A. (2017). Factors influencing big data decision-making quality. *Journal of Business Research*, *70*, 338–345. https://doi.org/10.1016/j.jbusres.2016.08.007

Johns, G. (2006). The essential impact of context on organizational behavior. *Academy of Management Review*, *31*(2), 386–408. https://doi.org/10.5465/AMR.2006.20208687

Judge, T. A., & Piccolo, R. F. (2004). Transformational and transactional leadership: A meta-analytic test of their relative validity. *Journal of Applied Psychology*, *89*(5), 755–768. https://doi.org/10.1037/0021-9010.89.5.755

Katkalo, V. S., Pitelis, C. N., & Teecey, D. J. (2010). Introduction: On the nature and scope

of dynamic capabilities. *Industrial and Corporate Change*, *19*(4), 1175–1186. https://doi.org/10.1093/icc/dtq026

Lord, R. G., Day, D. V, Zaccaro, S. J., Avolio, B. J., & Eagly, A. H. (2017). Supplemental Material for Leadership in Applied Psychology: Three Waves of Theory and Research. *Journal of Applied Psychology*, *102*(3), 434–451. https://doi.org/10.1037/apl0000089.supp

Maxwell, J. A. (2013). *Qualitative Research Design: An Interactive Approach* (Third edit). Thousand Oaks, CA, USA: Sage Publications.

McAfee, A., & Brynjolfsson, E. (2012). Big Data: The Management Review. *Harvard Business Review*, (October), 1–12. Retrieved from http://tarjomefa.com/wp-content/uploads/2017/04/6539-English-TarjomeFa-1.pdf

McKelvie, A., & Davidsson, P. (2009). From resource base to dynamic capabilities: An investigation of new firms. *British Journal of Management*, *20*, S63–S80. https://doi.org/10.1111/j.1467-8551.2008.00613.x

McKiernan, P. (2003). Turnarounds. In A. Campbell & D. O. Faulkner (Eds.), *The Oxford handbook of strategy*. Oxford University Press.

Merriam, S. B., & Tisdell, E. J. (2015). *Qualitative research: A guide to design and implementation*. John Wiley & Sons.

Miah, S. J., Vu, H. Q., Gammack, J., & McGrath, M. (2017). A Big Data Analytics Method for Tourist Behaviour Analysis. *Information and Management*, *54*(6), 771–785. https://doi.org/10.1016/j.im.2016.11.011

Migliore, L. A., & Chinta, R. (2017). Demystifying the Big Data Phenomenon for Strategic Leadership. *S.A.M. Advanced Management Journal*, *82*(1), 48–58.

Mikalef, P., Boura, M., Lekakos, G., & Krogstie, J. (2019). Big Data Analytics Capabilities and Innovation: The Mediating Role of Dynamic Capabilities and Moderating Effect of the Environment. *British Journal of Management*, *30*(2), 272–298. https://doi.org/10.1111/1467-8551.12343

Mikalef, P., Krogstie, J., Pappas, I. O., & Pavlou, P. (2020). Exploring the relationship between big data analytics capability and competitive performance: The mediating roles of dynamic and operational capabilities. *Information and Management*, *57*(2), 103169. https://doi.org/10.1016/j.im.2019.05.004

Mikalef, P., Pappas, I. O., Krogstie, J., & Giannakos, M. (2018). Big data analytics capabilities: a systematic literature review and research agenda. *Information Systems and E-Business Management*, *16*, 547–578. https://doi.org/10.1016/j.amepre.2004.03.006

Morse, J. M., Barrett, M., Mayan, M., Olson, K., & Spiers, J. (2002). Verification Strategies for Establishing Reliability and Validity in Qualitative Research. *International Journal of*

Qualitative Methods, *1*(2), 13–22. https://doi.org/10.1177/160940690200100202

Mumford, M. D., Antes, A. L., Caughron, J. J., & Friedrich, T. L. (2008). Charismatic, ideological, and pragmatic leadership: Multi-level influences on emergence and performance. *The Leadership Quarterly*, *19*(2), 144–160. https://doi.org/10.1016/j.leaqua.2008.01.002

Mumford, M. D., & Van Doorn, J. (2001). The leadership of pragmatism: Reconsidering Franklin in the age of charisma. *Leadership Quarterly*, *12*(3), 279–309.

Oberer, B., & Erkollar, A. (2018). Leadership 4.0: Digital Leaders in the Age of Industry 4.0. *International Journal of Organizational Leadership*, *7*(4), 404–412. https://doi.org/10.33844/ijol.2018.60332

Oc, B. (2018). Contextual leadership: A systematic review of how contextual factors shape leadership and its outcomes. *The Leadership Quarterly*, *29*(1), 218–235. https://doi.org/10.1016/j.leaqua.2017.12.004

Pasternack, B. A., & Toole, J. O. (2002). Yellow-light leadership: How the world's best companies manage uncertainty. *Strategy and Business*, (27), 74–83. Retrieved from https://www.strategy-business.com/media/file/18563.pdf

Patton, M. Q. (2014). *Qualitative research & evaluation methods: Integrating theory and practice*. Sage publications.

Pigni, F., Piccoli, G., & Watson, R. (2016). Digital data streams: Creating value from the real-time flow of big data. *California Management Review*, *58*(3). Retrieved from http://cmr.ucpress.edu/content/58/3/5.abstract

Podsakoff, P. M., Bommer, W. H., Podsakoff, N. P., & MacKenzie, S. B. (2006). Relationships between leader reward and punishment behavior and subordinate attitudes, perceptions, and behaviors: A meta-analytic review of existing and new research. *Organizational Behavior and Human Decision Processes*, *99*(2), 113–142. https://doi.org/10.1016/j.obhdp.2005.09.002

Pugna, I. B., Duţescu, A., & Stanila, O. G. (2019). Corporate attitudes towards Big Data and its impact on performance management: A qualitative study. *Sustainability*, *11*(3), 684. https://doi.org/10.3390/su11030684

Qi, C. chong. (2020). Big data management in the mining industry. *International Journal of Minerals, Metallurgy and Materials*, *27*(2), 131–139. https://doi.org/10.1007/s12613-019-1937-z

Robbins, S., Judge, T. A., Millett, B., & Boyle, M. (2013). *Organisational behaviour: Pearson Higher Education AU*.

Saunders, M., & Lewis, P. (2018). *Doing research in business & management: An essential guide to planning your project* (2nd ed.). Pearson.

Sena, V., Bhaumik, S., Sengupta, A., & Demirbag, M. (2019). Big Data and Performance:

What Can Management Research Tell us? *British Journal of Management*, *30*(2), 219–228. https://doi.org/10.1111/1467-8551.12362

Shamim, S., Zeng, J., Shariq, S. M., & Khan, Z. (2019). Role of big data management in enhancing big data decision-making capability and quality among Chinese firms: A dynamic capabilities view. *Information & Management*, *56*(6), 103135.

Silverman, D. (2011). *Interpreting Qualitative Data- A Guide to the Principles of Qualitative Research*. Sage Publications.

Snowden, D. J., & Boone, M. E. (2007). A Leader's Framework for Decision Making. *Harvard Business Review*, *85*(11), 68–76. https://doi.org/10.1109/MCDM.2007.369449

Srnka, K. J., & Koeszegi, S. T. (2007). From words to numbers: how to transform qualitative data into meaningful quantitative results. *Schmalenbach Business Review*, *59*(1), 29–57. https://doi.org/org/10.1007/BF03396741

Stiles, W. B. (1993). Quality control in qualitative research. *Clinical Psychology Review*, *13*(6), 593–618. https://doi.org/10.1016/0272-7358(93)90048-Q

Sun, P. Y. T. (2013). The servant identity: Influences on the cognition and behavior of servant leaders. *The Leadership Quarterly*, *24*(4), 544–557. https://doi.org/10.1016/j.leaqua.2013.03.008

Sun, P. Y. T., & Anderson, M. H. (2012). Civic capacity: Building on transformational leadership to explain successful integrative public leadership. *The Leadership Quarterly*, *23*(3), 309–323. https://doi.org/10.1016/j.leaqua.2011.05.018

Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, *51*(1), 40–49. https://doi.org/10.1016/j.lrp.2017.06.007

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, *18*(7), 509–533. https://doi.org/10.1142/9789812796929_0004

Van den Steen, E. (2017). Strategy and the Strategist: How it Matters Who Develops the Strategy. *Management Science*, *64*(10), 4533–4551. https://doi.org/10.2139/ssrn.2383972

Wamba, S. F., Gunasekaran, A., Akter, S., Ren, S. J.-F., Dubey, R., & Childe, S. J. (2017). Big data analytics and firm performance: effects of dynamic capabilities. *Journal of Business Research*, *70*, 356–365. https://doi.org/10.1108/MD-08-2019-020

Woiceshyn, J., & Daellenbach, U. (2018). Evaluating inductive vs deductive research in management studies: Implications for authors, editors, and reviewers. *Qualitative Research in Organizations and Management: An International Journal*, *13*(2), 183–195. https://doi.org/10.1108/qrom-06-2017-1538

Zeng, J., & Glaister, K. W. (2018). Value creation from big data: Looking inside the black box. *Strategic Organization*, *16*(2), 105–140.

https://doi.org/10.1177/1476127017697510

Zhou, Z.-H., Chawla, N. V, Jin, Y., & Williams, G. J. (2014). Big data opportunities and challenges: Discussions from data analytics perspectives [discussion forum]. *IEEE Computational Intelligence Magazine*, *9*(4), 62–74.

Zikmund, W. G., Badin, B. J., Carr, J. C., & Griffin, M. (2013). *Business Research Methods* (9th ed.; M. Roche, ed.). South Western: Cengage Learning.

Appendix A – Consistency matrix

Table 2: Consistency matrix

How leadership style can enhance big data decision-making capability that result in a competitive advantage			
Questions	**Literature Review**	**Data Collection Tool**	**Analysis**
Research question 1 *How are the four dimensions of transformational leadership influencing big data decision-making capabilities?*	(Anderson & Sun, 2017) (Judge & Piccolo, 2004) (Janssen et al., 2017) (Shamim et al., 2019)	Question 7,8 and 9 in the interview guide	Content analysis to determine if there is a trend and part that can be categorised. Link concepts back to the four dimensions of transformational leadership.
Research question 2 *How are the three dimensions of transactional leadership influencing big data decision-making capabilities?*	(Anderson & Sun, 2017) (Judge & Piccolo, 2004) (Janssen et al., 2017) (Shamim et al., 2019)	Question 7,8 and 10 in the interview guide	Content analysis to determine if there is a trend and part that can be categorised. Link concepts back to the three dimensions of transactional leadership.
Research question 3 *How are the leadership self-identities influencing big data decision-making capabilities?*	(Anderson & Sun, 2017) (Janssen et al., 2017) (Shamim et al., 2019)	Question 7,8 and 11 in the interview guide	Content analysis to determine if there is a trend and part that can be categorised. Link concepts back to the five leadership self-identities.
Research question 4 *How can a leader utilise different behaviours in different contexts to influencing big data decision-making capabilities?*	(Anderson & Sun, 2017) (Johns, 2006) (Oc, 2018)	Question 7,8 and 12 in the interview guide	Content analysis to determine if there is a trend and part that can be categorised. Link concepts back to the omnibus and discrete level of contextual leadership.

Appendix B – Interview guide

Guide points for the interviews:

1. (15 minutes before interview) Check Lights for camera visibility and test recording
2. Remember to **start recording**
3. Greet participant
4. The consent form must be completed with consent for recording
    a. Recording – only used for transcribing and analysis
    b. Confidentiality
    c. Free to disconnect and free to speak your mind
5. Explain purpose of the study
    a. What leadership style can enhance the Making of quality decisions from Big Data?
6. Background information
    a. What is your understanding of Big Data?
7. Leaders' influence on big data decision-making capabilities
    a. What do you feel is your influence on your organisation's ability to make quality decisions?
    b. What advice can you give other managers to increase the quality of their decisions?
    c. Explain Data Chain – **Collecting, processing, analysing, & decision-making**
8. General leadership style
    a. Please share a reflection on your own leadership style
    b. How can this leadership style be used to enhance your organisation's big data decision-making capabilities?
    c. If you can, give advice as a mentor to another leader that would like to grab a competitive advantage from Big Data.
9. Transformational leadership
    a. Please choose some of these dimensions of leadership that you associate yourself with; you can choose more than one or none – the dimensions are:
        i. charisma,
        ii. inspirational motivation,
        iii. intellectual stimulation, and
        iv. individualised consideration.

    Let me know if you need more detail on any of these.

    b. Why did you choose those?
    c. Can any of these be helpful to improve your team's ability to make quality decisions from big data?
10. Transactional leadership
    a. Please choose some of these dimensions of leadership that you associate yourself with; you can choose more than one or none – the dimensions are:
        i. contingent reward,
        ii. active MBE, and
        iii. passive MBE
    b. Why did you choose those?
    c. Can any of these be helpful to improve your team's ability to make quality decisions from big data?

11. Leadership self-identities
    a. Please choose some of these identities of leadership that you associate yourself with; you can choose more than one or none – the identities are:
        i. visionary,
        ii. relational,
        iii. creative,
        iv. manager, and
        v. community-orientated
    b. Why did you choose those?
    c. Can any of these be helpful to improve your team's ability to make quality decisions from big data?
12. Contextual leadership
    a. How do you see the situation or context the leader finds himself or herself in affecting their leadership style?
13. Encourage any additional feedback on leadership styles or any other context related comments.
14. Ask for referral interview

Appendix C – List of codes grouped into themes

All the codes used during the analysis of the interviews are listed in Table 4. The first column refers to the specific results section in this document. The second column corresponds to the theme the code was used in, and also the heading of the specific section in this document. The third column indicates the code that is prefixed with a category group number and a sequence number in that specific category group, as explained in section 4.9. The fourth column is the number quotes that the code was linked to, and the last column indicates the number of network links that the code was involved in.

Table 4: List of codes grouped into themes

Results section number	Code Groups (Theme)	Code	Grounded	Density
5.3.1	T0-1-Big data definition from executive leaders' perspective	0-02-BD is more than BI and other machine data	10	4
		0-06-Structured & unstructured from various sources	13	7
		0-09-BI and other machine data seen as BD	6	5
		0-11-Proliferation of data because everything is connected	3	7
		0-13-Every user leaves a footprint or trail of data	2	3
		4-24-BD DM Capability should rather be Data Driven DM	3	2
		5-07-Focus on consumer journey	9	2
		5-08-Understanding the consumer behaviour	14	2
		5-57-Organisations doing data analysis for long but now it is more integrated	3	2
5.3.2	T0-2-Special considerations needed for big data, as seen by executive leaders	0-01-BD is evolving and volumes are increasing fast	12	5
		0-05-Context matters-Consider where data is from and other circumstances	5	4
		5-11-BD is a journey	10	2
		5-25-Data needs to be real-time to make quick decision	10	2
		5-31-Storage was the problem in the past, not anymore	3	2
		5-32-Big Data makes DM non-emotional	2	2

Results section number	Code Groups (Theme)	Code	Grounded	Density
		5-40-Data and AI could be brilliant but they need to serve the business goals	15	2
		5-45-Integrity and definition of the data are important	15	3
5.3.3	T0-3-Benefits from big data, and challenges to achieve the benefits	0-03-Business does not get all the benefit from BD, they do not know how or misunderstand it	26	3
		0-04-Using BD in DM is not easy	8	4
		0-07-Beneficial for many sectors	7	2
		0-08-Only some firms are native BD, others not-Both can benefit	3	2
		0-12-BD allows for more insights and better understanding	1	3
		4-21-Interesting Topic and understanding how leadership can enhance BD DM Capability is needed	11	8
		5-10-BD requires large investment, leader needs to provide the resources	12	1
		5-24-Modern business requires BD for DM, due to competitive environments	7	2
		5-37-BD as a catalyst to drive improvement & track progress	3	3
		5-46-Room for improvement in business by using BD	7	8
5.4.1	T1-1-Transformational leader to inspire a vision and unite all to be data-driven	1-01-Charisma	15	2
		1-02-Inspirational motivation	26	6
		1-05-Transformational to set vision	18	3
		1-06-Charismatic leader not essential for BD	8	1
		1-07-Transformational needed to transform organisation to BD	10	2
		5-26-Learn from others, look at case studies and other successful companies	11	2
		5-30-Set an unconstrained vision	6	4
		5-38-Motivate and inspire team through storytelling	6	1
		5-48-BD DM needs to focus on the odds of the possible, assist with scenario planning	6	3
5.4.2		1-03-Intellectual stimulation	26	3

Results section number	Code Groups (Theme)	Code	Grounded	Density
	T1-2-Transformational leader with intellectual stimulation and individualised consideration for sustainable benefit	1-04-Individualised consideration	14	6
		1-08-Intellectual stimulation is important for the data scientists	8	2
		1-09-Individualised consideration-reskilling people is important-Data Literacy	7	2
		1-10-Individualised consideration focus on listening skills to followers and customers	3	2
		1-11-Individualised consideration not important	1	1
		4-01-Execution not only transactional	4	6
		5-50-Data scientists need to understand business	1	2
5.5.1	T2-1-A transactional leader needed for strategic execution	2-01-Contingent reward	18	6
		2-04-Transactional needed for execution	18	8
		2-05-Leader needs to drive & reward outcomes	3	2
		2-06-No need to get transactional	8	4
		2-09-Contingent reward focused on business outcomes	6	2
		2-10-Reward is important, not only financial, also work-life balance and other	11	2
		2-11-BD plays an important role in measuring KPI for contingent reward	6	1
		2-12-Transactional needed to ensure data integrity and accuracy	1	1
		2-13-COVID made transactional style more prominent, at least a blend of it	2	1
		2-18-Contingent reward because, if well designed, it clarifies the expectations	4	3
		2-20-Transactional seen as the management part of your role	2	2
		5-23-Execution of BD strategy is important	2	2
		5-54-Clear roles and responsibilities and accountabilities of who does what with BD	7	2
5.5.2	T2-2-Transactional leader must	2-02-Active MBE	8	7
		2-03-Passive MBE	11	6
		2-07-Active MBE risk to micromanage	5	2

Results section number	Code Groups (Theme)	Code	Grounded	Density
	balance active and passive MBE	2-08-Allow managers to manage but stay involved	6	2
		2-14-Passive MBE, followers know their work, you expect thinking and creativity-Trust them	4	1
		2-15-Use active & passive MBE, depending on the follower	3	2
		2-16-Passive relates to transformational and active relates to transactional leadership	1	3
		2-17-Passive only needed for operational environments	1	2
		2-19-Active MBE because of the effects of exceptions on the Data Chain	2	2
		2-21-MBE create trust issues that will affect data integrity and accuracy	3	2
		5-12-Use Agile PM	9	3
5.6.1	T3-1-Strong visionary leader with a fine balance of management skills to execute	3-01-Visionary	47	3
		3-04-Manager	34	4
		3-06-Visionary more important than other self-identities	4	2
		3-09-Manager is important for execution	5	2
		3-11-Manager not needed at exco level	4	2
		3-17-Flatten operational model-things to work together not for each other	1	1
		5-41-Set a clear plan to get to the vision, make it practical	5	2
5.6.2	T3-2-Role of a relational, creative, and community-orientated leader	3-02-Relational	21	3
		3-03-Creative	27	3
		3-05-Community-orientated	23	3
		3-08-Creative not so important for exco	4	2
		3-13-Followers are becoming more community-orientated-working for the good of society-Future Value	7	1
		3-15-Relational is important for execution and knowing your market and where your blind spots are	5	1

Results section number	Code Groups (Theme)	Code	Grounded	Density
		3-18-Focus your BD skills to also solve community challenges-Channel CSI through your skills	7	1
		3-19-Creativity important because BD gives you opportunities for new markets	3	2
		5-56-Leading BD is a political role, understand who needs what data where and collaborate between silos	7	1
5.6.3	T3-3-Feedback on the leadership self-identity concept	3-07-No Self-identity missing	3	3
		3-10-Mindset of a leader can be added as an self-identity	2	1
		3-14-Intellectual self-identity missing	2	1
		3-16-Self-Identities as a pyramid with visionary at the top and community at the bottom	2	5
		3-20-Value driven self-identity needed-Make sure all actions are rational and aimed at business needs	2	1
5.7.1	T4-1-Adjust leadership style to where you are in the big data journey or what the context requires	4-02-Leadership style depending on situation and phase of business in their BD journey	39	2
		4-07-Strong commercial skills	1	1
		4-14-There is not just one leadership style, it is complex	11	4
		4-29-How you do it makes the difference between transactional and transformational	1	1
		5-42-Every team member has a unique contribution-Fit your style to them	11	2
5.7.2	T4-2-Executive commitment to data-driven decisions and leadership style to support	4-03-Pragmatic Leadership	2	4
		4-08-Curiosity about BD	1	4
		4-10-Leader should not be afraid to start the BD journey	6	4
		4-11-Leader should not be set to follow intuition but be data driven	19	1
		4-12-Leader should be open to change and learn	8	4
		4-13-Leader needs to be analytical	4	4
		4-15-It starts with the leader, you need to challenge yourself	4	2

Results section number	Code Groups (Theme)	Code	Grounded	Density
		4-19-Willing to be proven wrong, failures is acceptable, learn and move on	5	4
		4-20-Create unified view of how BD creates value, all speaking the same language	17	3
		4-22-Exco needs to trust BD recommendation from lower levels and focus on leading	7	1
		4-26-Hands-on leadership	9	3
		4-30-Leader does not need to be analytical and pragmatic	3	2
		5-06-BD not only priority of CDO/CIO	5	2
		5-14-Leader to have technical BD skills or not?	20	2
		5-18-Leader need deep understanding of data	30	5
		5-36-Become a consumer of the information, become passionate about the data	6	2
		5-53-Leader need to create a data culture, everyone focused on links of the data chain	26	3
		5-58-Experimentation with BD is required, failure must also be rewarded-it leads to discovery	6	5
5.7.3	T4-3-Strategy drives leadership style	3-12-Types of questions a leader asks is affected by his self-identity	2	0
		4-04-Transformational and transactional needed	20	0
		4-17-Leader needs to be rational	5	0
		4-23-Just because there is more data with BD does not change levels of work and leadership style	6	0
		4-25-Data can direct the leader in what style to use	1	0
		4-27-If you are not transactional then get a transactional leader lower down to support you during execution	1	0
Not Used - Will	T5-1-Company strategy drives data strategy	5-01-Data management strategy focuses on firm strategy	58	0
		5-02-Set requirement without data	12	0

Results section number	Code Groups (Theme)	Code	Grounded	Density
benefit others		5-03-Define business problem properly, ask the right questions	36	0
		5-04-Bi-directional effect of data and strategy	7	0
		5-27-Next generation data-Analyse data and see where it can benefit	9	0
		5-33-Business strategy and future vision need to drive BD strategy and data collection	54	7
		5-34-What data we collect should not be technology-driven	4	0
		5-51-Aim the BD and AI initiatives at making a difference in the large parts of your business	8	0
Not Used - Will benefit others	T5-2-Total commitment to data driven decision-making by everyone, including the top leadership	5-05-Exco drive the inclusion of BD in strategy	16	0
		5-21-Leadership commitment to BD vision	14	0
		5-22-Leaders do influence BD DM Capability	10	0
		5-29-Understand the power BD	11	0
		5-35-DB DM and intuition needs challenge each other	6	0
Not Used - Will benefit others	T5-3-What requirements and characteristics are needed from the leader to benefit from data driven decision making?	5-43-Governance is important to control action based on BD	6	0
		5-16-Leader needs to be able to monetise the data	5	0
		5-39-Break barrier between IT and Business	6	0
		0-14-Chief Data Officer vs Chief Digital Officer	2	0
		5-44-Get right data at the right level of the organisation	6	0
		5-52-Make sure the head of data does not protect his own agenda and understanding. Need for open-mindedness	4	0
		5-19-Visualisation, dashboard and automated data gathering, processing and analysing	11	0
		4-28-Understanding and Influencing stakeholders	3	0
		5-55-Data governance to focus on protection, processing and analysis of information	4	0

Results section number	Code Groups (Theme)	Code	Grounded	Density
		4-18-Combine arts and science in DM	3	0
		5-13-Drive small incremental change	16	0
		5-49-Collaborate with other BD companies that can assist, and make them strategic partners	8	0
		5-09-Set yourself up for success	7	0
		5-47-BD breaks down silos	4	0
		4-05-Growth mindset	4	0
		4-06-Collaboration is key	10	0
		5-17-Focus on Change Management	9	0
		4-16-Leader needs to balance between AI, robots and people	2	0
		5-20-BD too optimise operations and solve operational problems	12	0
		0-10-Opinion that BD and associated tech needs to be phased in slowly	1	0
		5-15-Measure results compared to the original goal	3	0
		5-28-Understand the value of the customer	2	0
		4-09-Communication is important	3	0

Appendix D – Ethical clearance

This screen capture shown in Figure 19 serves as proof that the researcher had ethical clearance to collect the data used for this research.

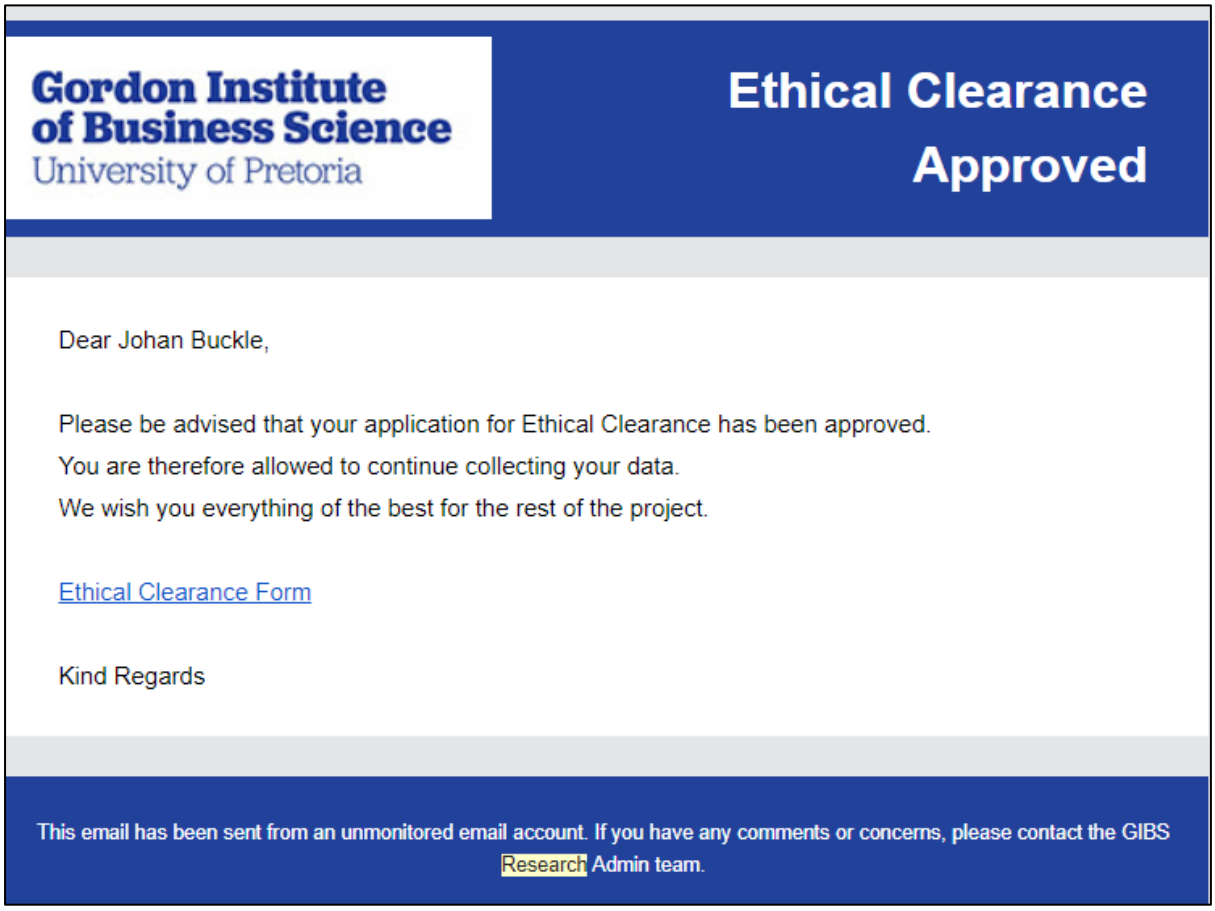

Figure 19: Ethical clearance email screen capture