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Big Data Analytics

The Relationship Between Organizational Culture and the Critical Success Factors of Big Data Analytics

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ABSTRACT:
Over the past years, big data analytics (BDA) has gained more attention in both academic fields and business communities, and it was perceived as very beneficial for organizations. However, taking into consideration the quick and chaotic nature of its evolution, in addition to its high dependence on cutting edge technologies, BDA implementations were characterized as vague and risky projects with high failure rates. Thus, knowing the critical success factors (CSFs) for BDA implementations gains special importance to influence its success, and because the effects of organizational culture on information systems has been noted by many researchers, it is urged that it also affects BDA and its CSFs. In fact, culture has been urged to have a more significant impact than technological aspects. In this exploratory research, we investigate how differently the culture of an organization can affect the CSFs of BDA implementation. We conducted five interviews with five different companies, and the results show that different organizational culture affects the CSFs of BDA differently. Moreover, we find that the relationship between CSFs of BDA and organizational culture is bidirectional, as BDA incurs cultural changes in organizations.

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I would like to thank my two wonderful sons for inspiring me for the best in my life. I love you.

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I would like to give many thanks to my family for their unending support, understanding, love and encouraging me to be myself and walk on my own path. It's not easy but I am so happy that I could do so. Love you.

Ruochen Wang

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1 Introduction

This chapter presents background information about the research including big data (BD) and Big Data Analytics (BDA). It identifies the problem area and comes out with a research question for this research. Moreover, it presents research delimitation.

1.1 Background

"To make money, you've got to predict two things—what's going to happen and what people think is going to happen."

Hal Varian

Business, in general, has now become more competitive, and the organizations need to adapt more rapidly and boldly to survive (Popovič et al., 2016). Organizations must continuously seek ways to improve their ability to respond to the increasingly competitive demands by identifying the constraints in their business practices and procedures (Popovič et al., 2016). Hence, some studies suggest that firms should focus on the development of organizational agility (Chakravarty, Grewal, & Sambamurthy, 2013), which enables them to cope with rapid, fierce, and uncertain changes and help them explore new opportunities to improve their business performance (Chakravarty et al., 2013). Information systems (IS) are believed to have the capability to create organizational agility (Sambamurthy et al., 2007). IS, such as enterprise resource planning (ERP), and customer relationship management (CRM) allows firms to detect changes rapidly, alter market strategies flexibly, and thus react quickly to the changing environment (Sambamurthy et al., 2007). Consequently, firms have been increasingly investing in various information technologies (IT) and applying them in their business processes (Chen, Chiang, & Storey, 2012). Particularly, data-driven business analytics are regularly highlighted as the foundation for innovation and agility (Chen & Siau, 2011; Davenport, Barth, & Bean, 2012), since novel insights could be generated from those rich, detailed and contextualized data of relevance to any organization (Agarwal & Dhar, 2014).

Big data analytics (BDA) has become critical in both academic fields and business communities over the past years (Chen et al., 2012). Big data is viewed as a unique and vital corporate asset by more and more companies (Lohr, 2012; Russom, 2011), and many companies turned their eyes to gain profits from BDA to seek competitiveness and opportunities. In fact, it has been said that "The big data tsunami is sweeping over enterprises and changing the business landscape" (Chen et al., 2016, p. 5096). Grover et al. (2018) state that organizations are using big data to adapt better to the new business environment in addition to achieving competitive advantages against competitors, as BDA opens excellent opportunities for organizations to understand their business and markets and enhance their decision-making accuracy and timing (Chen et al., 2012). Moreover, the relationship between big data and analytics is emphasized by Russom (2011) as he argues that advanced analytics and BD should be put together now since the analytics platform today could handle big data better than ever.

Nevertheless, BDA implementation is not as easy. The 2019 Big Data and AI Executive Survey suggest that some leading corporations may fail to be data-driven. According to this survey,

though 92% of the respondents are increasing their investment in big data and AI, only 31% have a "data-driven organization" and 28% have a "data culture". It is well to be mentioned that the respondents of the survey are all leading companies in the world, including JP Morgan, Citizens Bank, American Express, and London Stock Exchange (Davenport & Bean, 2019).

The failure rate drove researchers to investigate critical success factors (CSFs) of BDA implementation. CSFs refer to "the few key areas where things must go right for the business to flourish" (Rockart, 1979, p. 85). The CSFs of BDA implementation identified in literature includes technology resources, top management support, business strategy, institutional based trust, change management, organizational structure, and analytics skills (Cato, Gölzer, & Demmelhuber, 2015; Gao, Koronios, & Selle, 2015; Sun et al., 2018). Among these factors, organizational culture plays an important role. As Alharthi, Krotov, and Bowman (2017) indicate, many obstacles related to BDA implementation tend to be related to organizational culture. LaValle et al. (2011) also point out that most barriers of BDA implementation are managerial and cultural rather than technological. Furthermore, it is suggested that organizational culture allows firms to better benefit from IT (Claver et al., 2001). Hence, it is crucial to consider how different organizational cultures leverage those CSFs to implement BDA in organizations successfully.

1.2 Problem Area

The relationship between organizational culture and BDA project success is noted by several studies (Alharthi et al., 2017; Gupta & George, 2016; McAfee & Brynjolfsson, 2012). For instance, Alharthi et al. (2017) suggest that without a good understanding of organizational culture (Such as assumptions, values, norms, and symbols), organizations cannot see how BDA could improve their business operations and consequently see little value in implementing BDA in organizations.

However, we identified that the relationship between organizational culture and BDA implementation success factors is an important aspect that should not be overlooked. Many studies approach culture relation to BDA from a data-driven culture perspective (LaValle et al., 2011; Wang, Kung, & Byrd, 2018) but not on the success of BDA implementation based on the various organizational culture types, despite the existence of several studies that address the relationship between culture and other types of information systems such as relationships between culture and knowledge management systems or ERP systems (Harper & Utley, 2015; Ke & Wei, 2008; Park, Ribiere, & Jr, 2004; Schein, 2004). Hence, we consider that this thesis has the potential to compensate for this lack of research on the topic.

1.3 Research question and purpose

According to the background and problem area section, we investigate the following research question:

- *How does the organizational culture affect the CSFs of BDA implementation?*

The purpose of this thesis is to investigate how differently would types of organizational culture impact the CSFs of BDA implementations. This is based on considering CSFs of BDA implementations in the context of different organizational cultures. In doing so, we challenge the current research trend that separating CSFs with cultural context since we argue that organizational culture has a substantial impact on success factors and both culture and CSFs should be put together to discuss. Moreover, empirical research for investigating such topics is limited (Alharthi et al., 2017; LaValle et al., 2011; Wang et al., 2018). Thus, this thesis tries to bridge the gap and contribute to academia in this field. Furthermore, we believe that knowing the impact of various types of organizational culture on CSFs is important for researchers and practitioners since such understanding could let them focus more on culture fit while considering CSFs, thus thinking of BDA implementation holistically and improving the chance of successful implementation of BDA in their organization.

1.4 Delimitations

This thesis is delimited in BDA management aspects. The details of big data (BD) technology architectures or configurations will not be taken into account. Moreover, investigating the BDA implementation process will be from agility and methodological perspectives, and not according to the process performance measures such as cost, quality and time. Besides, though there are over 80 instruments and approaches for exploring organizational cultures (Jung et al., 2009), this study will only adopt Cameron and Quinn (2006)'s Organizational Culture Assessment Instrument (OCAI) to conduct our research. That is, this study will investigate our research question from the perspective of different types of organizational cultures, instead of different organizational culture attributes. The motivation for this choice will be presented in the theoretical background part. Furthermore, this study will focus on a series of typical but limited number of CSFs that will be identified from the literature review, which means it will not cover all CSFs that relate to BDA implementation.

2 Theoretical Background

This chapter presents the theoretical foundation of the research including definitions of BD, BDA, organizational culture, and CSFs for BDA. Besides, it contains a literature review to identify the CSFs of BDA and the relationship between organizational culture and BDA. Moreover, it presents an investigation of several instruments to assess organizational culture with a review of various organizational culture categories. Also, a conceptual model for the research is presented.

2.1 Big Data Analytics

2.1.1 BDA Definition

Russom (2011) Defines BDA as "where advanced analytic techniques operate on big data sets." (p. 5). Which means that BDA contains two main parts, the first is the advanced analytics and the second is the BD. As for advanced analytics, it refers to a collection of tools and techniques such as predictive analytics, data mining, statistical analysis, complex SQL, artificial intelligence (AI) and data visualization (Russom, 2011). Advanced analytics helps companies to understand their operations and customers (Bose, 2009). Organizations can apply the insight they gained from advanced analytics to enhance their decision-making processes to achieve their business objectives successfully (Bose, 2009).

As for BD, which is perceived differently by different people (Koronios, Gao, & Selle, 2014), because a universally and formally accepted definition is hard to find due to its quick and chaotic evolution in the recent years (DeMauro, Greco, & Grimaldi, 2016). For instance, it has been described as "The term big data is used to describe the massive volume of digital data produced by human activity that is very difficult to manage using conventional data analysis tools." (Alharthi et al., 2017, p. 286). However, to make the study clear and scoped, DeMauro et al. (2016)'s proposed BD definition is adopted in this thesis since their definition covers all the essential attributes of BD, which is "big data is the information asset characterized by such a high volume, velocity, and variety to require specific technology and analytical methods for its transformation into value" (DeMauro et al., 2016, p. 122). This definition reveals the main characteristics of BD, which include according to DeMauro et al. (2016):
- Volume, velocity, and variety describe the main characteristics of BD.
- There is a need to adopt specific technology and analytical methods to exploit BD.
- BD can be transformed into something valuable for organizations.

Thus, the 3 Vs (Figure 2.1) which are volume, velocity and variety can define BD (Russom, 2011). Volume refers to the huge size of the generated data (Raguseo, 2018), for example, 2.5 exabytes of data were generated every day in 2012, a number that is doubled every 40 months (McAfee & Brynjolfsson, 2012). Velocity refers to the data production or analysis speed by an application, while variety refers to the different types of produced data, such as structured, non-structured, and semi-structured data (Raguseo, 2018). For example, big data can be generated

from a GPS signal, an image in social media, or a message (McAfee & Brynjolfsson, 2012). Moreover, the three Vs can help to differentiate between analytics based on big data from business intelligence (BI), as there is an ambiguity between the two terms because they both use intelligence methods to get business advantages from data (McAfee & Brynjolfsson, 2012).. Volume refers to the huge size of the generated data, for example, 2.5 exabytes of data were generated every day in 2012, a number that is doubled every 40 months. Velocity refers to the data production or analysis speed by an application, while variety refers to the different types of produced data, such as structured, non-structured, and semi-structured data. For example, big data can be generated from a GPS signal, an image in social media, or a message. Moreover, the three Vs can help to differentiate between analytics based on big data from business intelligence (BI), as there is an ambiguity between the two terms because they both use intelligence methods to get business advantages from data.
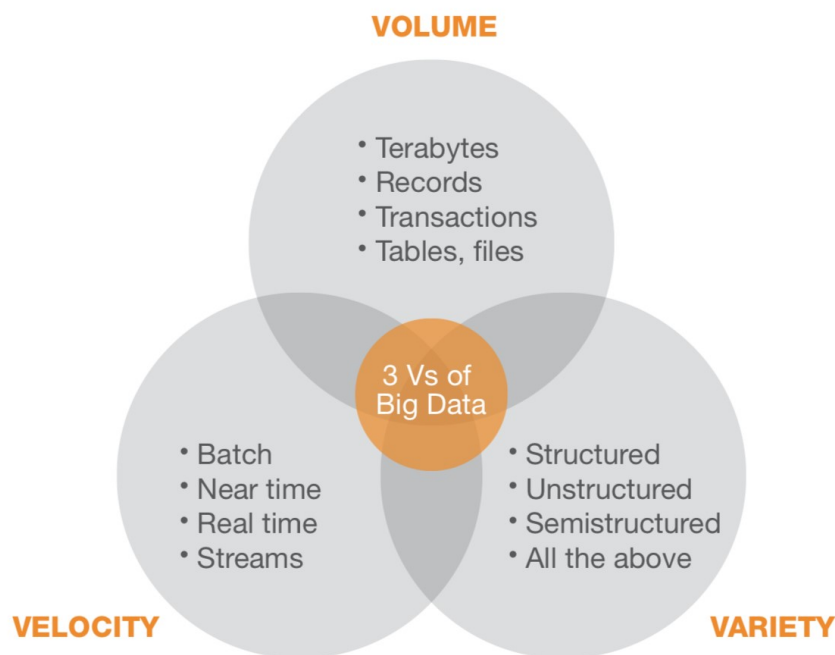
Figure 2.1: The three Vs of BD (Russom, 2011, p. 6)

2.1.2 Critical success factors for BDA

Various sets of CSFs were generated by several project studies as an attempt to explain projects success or failure (Pinto & Covin, 1989). Boynton and Zmud (1984) define CSFs as "those few things that must go well to ensure success for a manager or organization, and they represent the managerial or enterprise areas that should have particular attention to drive success and performance" (p. 17)

However, many of the methods to assess the CSFs were found to be theoretical more than empirically proven (Pinto & Covin, 1989). Some researchers try to overcome this shortcoming by using methods to generate CSFs on a per company basis through structured interviews between experienced CSF analysts and key personals in the company (Boynton & Zmud, 1984).

Similarly, reviewing literature regarding CSFs in the context of BDA, we found that several studies identify different CSFs for BDA, based on different criteria, such as the perspective of

the study or the industrial context. For example, the following table contains CSFs for BDA from several studies that state different sets of CSFs. The first is from Félix, Tavares, and Cavalcante (2017) case study of Magazine Luiza, the second is based on the process view of CSFs of BDA by Gao et al. (2015) and the third is based on Chen et al. (2016) case study on Lufthansa implementation for BDA.

Table 2.1: CSFs of BDA

Literature	CSFs	Study
(Félix et al., 2017)	Strategic alignment, top management support, information sharing, agile methods and Communication.	Magazine Luiza Case Study
(Gao et al., 2015)	Business phase: • Identified business value • Clear and manageable project scope. Data phase • Identification and access to needed data sources. • Combine different data set. • High data quality • Data security and privacy. Analysis phase • Innovative analysis tools. • Adequate hardware. • Analysis skillset. • Technical skillset • Integration of new solutions. • Fast delivering of results • Cloud based solutions. • flexible IT-Structure. • Virtualization. • Visualization. • Adapt architectural principles. Implementation phase • Information strategy for big data • Big data as strategic instruments. • Interpretation of analytical results. Measurement phase • Clear project goal with deadline. • measurable outcome. Overall Phase • Top management support. • Multidisciplinary teams. • Independent business unit. • Iterative process model. • Outsourcing.	Process view for CSFs of BDA, categorize BDA based on project phases.
(Chen et al., 2016)	Effective value discovery process, direct CEO involvement, service-oriented mind-set, not blindly following IT Fashion, architectural foundation for growth and integration and talent planning	Lufthansa case study for BDA implementations

Moreover, literature review reveals several other perspectives to assess the success of BDA such as investigating measures for BDA implementation process (Ali et al., 2018; Rehman et al., 2016), maturity models (Halper & Stodder, 2014) or Gupta and George (2016)'s Resource-Based View to BDA. Thus, the lack of consensus about the CSFs of BDA was apparent, which makes eliciting the CSFs in the context of BDA more complicated. Therefore, in order to gain a general view of CSFs of BDA regardless of any specific industrial or research contexts, an analysis of available literature for potential CSFs of BD and BDA took place, using the following process: First, a review of literature in journals or reviews such as Harvard Business Review or MIT Sloan that related to BDA success factors. Google Scholar was used to search for articles. Sample keywords to search are "big data" + "critical success factors ", "big data analytics", "big data challenges", "big data + culture" and "big data barriers", in addition to investigate literature reference list. For this search we were interested in CSFs that are related to the managerial part of BDA implementation, so that technical parts will ultimately be excluded as per the research delimitation part of the first section. Second, CSFs were identified, they were grouped into categories based on their relevance to each other in addition to state the naming variation (in literature) for the CSFs. Third, the CSFs were sorted based on their frequency. Fourth, potential CSFs were selected based on two criteria, the first is frequency, and the second is relevance to culture, excluding CSFs that are related to technical aspects such as infrastructure and technical details. Finally, descriptions for the CSFs were set based on the reviewed literature.

Following this process, 130 factors were identified, after initial grouping for them, they became 38 groups. However, after the final grouping and eliminating of purely technical factors, 15 potential CSFs remained (see table 2.3). Besides, table (2.2) contains some of the naming variations for the identified CSFs as they were reported in literature differently.

Table 2.2: CSFs alternative naming variation as they were found in literature.

CSF	Names in literature
Skills	Skilled People, Skilled data-driven decisions, talent management, training, human resources, analytical and technical skill set, functional proficiency.
Technology	Strong data infrastructure, technology readiness, technology capabilities, Cloud computing, Good analytical tools, Analytical capabilities, Infrastructure, Adequate hardware
Leadership sponsorship	Leadership support, executive sponsorship, top management support
Vision	Vision, motive, effective value discovery process, identifiable business value, management priority.
Fact based decision making	Data orientation, analytics culture, decision making culture
Change management	Change management
Organizational structure	Well defined organizational structure, organizational IT structure
Strategy alignment	Alignment, business driven technical framework
Information sharing culture	Information sharing culture
IT-Business collaboration	IT/Business collaboration, multidisciplinary teams, business-centric championship.
Free experimentation	Freedom of experiments

Effective outsourcing	Outsourcing, vendor management, external outsourcing.
Process agility	Iterative process model, agile methodologies.
Communication	Communication
Trust culture	Trust culture

Table 2.3: Identified CSFs of BDA in Literature

	Skills	Technology	Leadership Sponsorship	Vision	Fact based decisions	Change management	Organizational structure	Strategic Alignment	Information sharing culture	IT-Business collaboration	Free experimentation	Effective outsourcing	Process agility	Communication	Trust culture
(Saltz & Shamshurin, 2016)	X	X			X	X	X	X		X	X		X		
(Halaweh & Massry, 2015)	X	X	X			X									
(Cato et al., 2015)	X	X	X	X		X	X	X		X	X				
(Yeoh & popovic, 2014)						X		X		X			X		
(Wamba, Akter, Edwards, & Chopin, 2015)	X	X	X			X									
(Sun et al., 2018)	X	X	X	X	X		X					X			X
(Felix et al., 2017)			X		X		X	X	X		X			X	
(Gao et al., 2015)	X	X	X	X			X			X		X			
(Watson, 2014)	X	X	X	X	X			X							
(Wang et al., 2018)	X	X							X						
(LaValle et al., 2011)	X		X	X					X						
(H.-M. Chen et al., 2016)			X	X								X			
(McAfee & Brynjolfsson, 2012)	X	X	X		X										
(Adrian, Abdullah, Atan, & Jusoh, 2017)	X	X		X	X										
(Sivarajah, Kamal, irani, & Weerakkody, 2017)									X						
(Chen, Schutz, kazman, & Matthes, 2016)	X	X													

Additionally, based on the reviewed literature, simple definitions for the CSFs were identified for the purpose of this study, as per table (2.4).

Table 2.4: Description of CSFs

CSF	CSF description
Skills	The availability of adequate skills at the company to be used with BDA implementation. Koronios et al. (2014), stated about people as one of *big data challenges (section 2.2),* "skills for Big Data project implementation will be a major issue in its success. Big Data experts, often called, 'Data Scientists' are very difficult to find and expensive to hire." (n.p.).
Technology	The availability of adequate technology at the company to be used with BDA implementation. Koronios et al. (2014) state about technology as one of *big data challenges (section 2.2),* "big data projects are dependent to a large extent on new technologies to handle the huge amounts of complex data at speed." (n.p.)
Leadership sponsorship	The degree of leadership sponsorship and support for BDA at executive, senior and departmental level. Halaweh and Massry (2015) state that "Without top management support and clear vision of the objectives of implementing big data analytics, the project is doomed to fail" (p. 28).
Vision	The organization understanding of how BDA analytics will improve business, LaValle et al. (2011) state "the leading obstacle of wide spread analytics adoption is the lack of understanding of how to use analytics to improve the business" (p. 23).
Fact-based decision-making culture	The tendency to make decisions based on facts rather than instinct. Watson (2014) states that "To benefit from big data analytics, decisions must be based on "the facts" (generated by analytics) "(p. 1254).
Change management	Effective change management related to IT, daily operations and culture. Cato et al. (2015) state that "Change management program describes a systematic change in business and operational processes as well as the decision styles for use in the exploitation of big data." (p. 137).
Organizational structure	Suitable organizational structure for BDA implementation, such as clear organizational structure, disseminating BDA through business areas and not exclusively through IT, creation of cross functional teams or involving several business units in BDA. Sun et al. (2018) state "Organization has a well-organized structure that is well-suited with the adoption of big data." (p. 198).
Strategy alignment	Align the BDA strategy with business strategy. Watson (2014) state" It is important to make sure that big data analytics projects support the business strategy. This is why most projects should be driven by business people rather than by IT. In analytics-based organizations, the alignment is especially close; in fact, it may be impossible to separate the business and analytics strategies. Without analytics as an enabler, the business strategy cannot succeed." (p. 1253).
Information sharing culture	The degree in which an organization have a culture of information sharing. Wang et al. (2018) state that "Without an information sharing culture, data collection and delivery will be limited, with consequent adverse impacts on the effectiveness of the big data analytical and predictive capabilities" (p. 10).
IT-Business collaboration	The degree of collaboration between IT and Business teams. Cato et al. (2015) state "Close collaboration between IT & business refers to high level of cooperation between IT department and business towards the development of big data systems." (p. 137).
Free experimentation	The degree of encouraging employees to develop creative ideas in implementing or using BDA. Cato et al. (2015) state that "freedom for experimentation refers to the encouragement of employees to experiment and develop creative new ideas on how to optimize and enrich operations with the use of big data." (p. 137).
Effective outsourcing	The degree of effective outsourcing and relationships with external partners such as vendors. Gao et al. (2015) state that "outsourcing has to be seen as a strategic partnership.

	Companies need to build up their own skills in order to succeed on a long term as big data is aiming for the overall organizational strategy" (p. 13).
Process agility	The degree in which the processes and methodologies used in implementation are iterative and agile. Yeoh and Popovič (2014) state that "The iterative development approach helped ensure that the project tasks were not lost in the frequently chaotic project environments, especially where some team members remained responsible for their regular duties. Therefore, it would seem that a business-driven and iterative development approach positively supports the success of a BI system implementation." (p. 142).
Communication	Effective communication within the organization. Félix et al. (2017) state that "big data projects conducted by technology areas should have an efficient communication for the promotion of the system, for its improvement and for conflict resolution. Communication enables IT and business areas to work in an integrated manner." (p. 120)
Trust culture	"The firm's belief that it will be safe to adopt big data (e.g., reliability, reliable platform, system trust safeguard, "strong relationship of trust", inter-organizational trust)" (Sun et al., 2018, p. 198)

2.2 Organizational culture

2.2.1 Definition

The definition of culture by Schein and Schein (2017) is used in this thesis, which is a slightly updated version of previous definitions of Schein (2004) and Schein (1986), and defines culture as:

> *The accumulated shared learning of that group as it solves its problems of external adaptation and internal integration; which has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think, feel, and behave in relation to those problems. This accumulated learning is a pattern or system of beliefs, values, and behavioural norms that come to be taken for granted as basic assumptions and eventually drop out of awareness.* (Schein & Schein, 2017, pp. 4 - 5)

Culture is a deep phenomenon (Schein, 1986), its definition and nature have been a debatable issue as it was described using different definitions (Bellot, 2011; Schein & Schein, 2017). However, there is agreement over several common concepts; Culture is described as "(1) holistic, (2) historically determined, (3) related to anthropological concepts, (4) socially constructed, (5) soft, and (6) difficult to change" (Hoftstede, Neuijen, & Ohayv, 1990, p. 286).

Schein (2004) divides the culture into three levels of abstraction based on how it appears for an external observer (see figure 2.2), the levels are artifacts, espoused beliefs and values, and underlying assumptions, where understanding culture cannot be achieved based on the artifact and the espoused values alone. Instead, the observer needs to investigate underlying assumptions and their role in establishing the artifact.
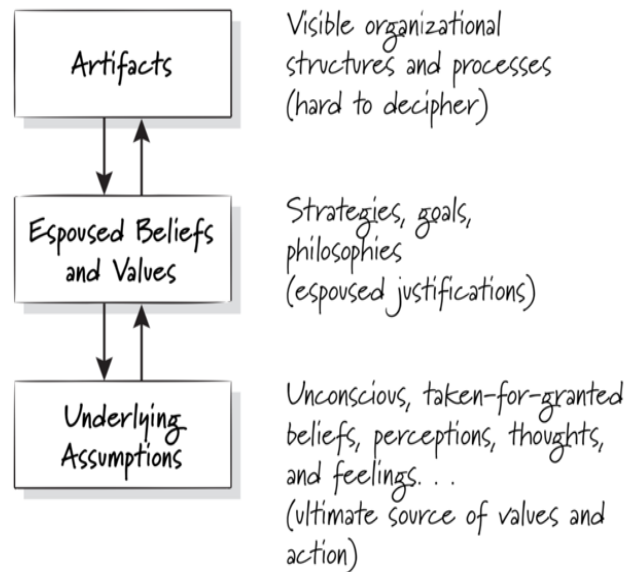
Figure 2.2: The three levels of culture (Schein, 2004, p. 26)

As for organizational culture, it is defined as "a set of values, symbols and rituals shared by the members of a specific firm, which describes the way things are done in an organization in order to solve both internal management problems and those related to customers, suppliers and the environment" (Claver et al., 2001, p. 248) .

2.2.2 Organizational culture and BDA

The organizational culture has been blamed for the failure of organizations and IS (Leidner & Kayworth, 2006). In fact, several researchers discuss how differences in cultural values can have a substantial impact on the way IS are developed, adopted, used and managed (Claver et al., 2001; Leidner & Kayworth, 2006; Mardiana, Tjakraatmadja, & Aprianingsih, 2018). Claver et al. (2001) highlight the relationship between IS, Information Technology (IT) and cultural values that result in a successful IS, as data quality, robust IT infrastructure and cultural values contribute largely to that success (see figure 2.3).

Moreover, Cameron and Quinn (2006) state that organizations have different cultures based on subunits, teams or hierarchy, which explains the difficulties in coordination between these sub-units because each unit has developed its own perspectives and set of values. The cultural differences between the subunits can affect the organization adversely, such as increased alienation and conflicts (Cameron & Quinn, 2006). However, even the conflicted subunits have common cultural characteristics that are shared with the entire organization (Cameron & Quinn, 2006).

In the context of BDA, organizational culture is urged to has high impact on the successful implementation of. For instance, (Alharthi et al., 2017) state that many barriers to the successful implementation of BDA are due to cultural aspects rather than technical aspects. Moreover, cultural barriers have been considered more important than data issues, for instance, it impacts the vision of how to use analytics in business improvement (LaValle et al., 2011). Cultural effects on leadership vision toward BD is emphasized as "Companies succeed in the big data era not simply because they have more or better data, but because they have leadership teams that set clear goals, define what success looks like, and ask the right questions." (McAfee &

Brynjolfsson, 2012, p. 8). Therefore, organizations need to move their cultures for a successful implementation of BDA from instinct based decision into data-based decision making, this is according to McAfee and Brynjolfsson (2012), as they raise a concern that many organizations pretend to be fact and data-driven, while they actually use the reports and data to support already taken decisions using legacy approaches.
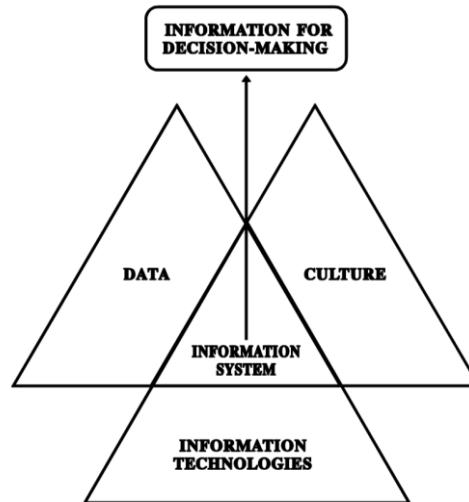
Figure 2.3: The relationship between data, IT and culture (Claver et al., 2001, p. 250)

2.2.3 Culture measures

According to Schein and Schein (2017), Assessing culture is a very complicated task as there are several models and methods to measure the culture of organizations and these methods depend on a large extent on the purpose of the cultural assessment. For instance, Jung et al. (2009) identified over 70 instruments to measure culture. Besides, it involves tasks like visiting the organization, identifying cultural artifacts, asking people, identifying espoused values, and looking for inconsistencies (Schein & Schein, 2017). The following table contains three of the popular and well-known methods to measure cultures:

Table 2.5: Several instruments to measure organizational culture.

Organizational Culture Profile (OCP)	Contains 54 value statements to assess the extent in which specific value characterize an organization or an individual, and these statements are supposed to be sorted and analyzed using Q-Sort factor analysis (O'Reilly, Caldwell, & Chatman, 1991).
Organizational Culture Assessment Instrument (OCAI)	Based on six dimensions (Appendix A) to assess an organization into four types according to the CVF (Cameron & Quinn, 2006; Cameroon & Quinn, 2011).
Organizational Culture Inventory (OCI)	This instrument assesses 12 cultural behavior and categorizes organizational culture into three categories (Constructive, passive/defensive and aggressive/defensive) as per Cook and Lafferty (1986 cited in Bellot, 2011) and Cooke and Szumal (2000). The instrument was used by thousands of organizations and nearly two million respondents (Cooke & Szumal, 2000). However, it is longer than OCAI and less user-friendly (Bellot, 2011).

2.2.4 OCAI

For the assessment of organizational culture, the OCAI (Appendix A) is used as presented by (Cameron & Quinn, 2006; Cameroon & Quinn, 2011) despite the existence of several alternatives to assess culture (Cameroon & Quinn, 2011; Cooke & Szumal, 2000; O'Reilly et al., 1991; Park et al., 2004; Schein & Schein, 2017). The OCAI instrument is f suitable for this thesis for several reasons. First, this thesis does not intend to dig deep into the underlying assumptions according to Schein (2004) classifications when assessing the cultural background of the interviewed companies. Instead, this thesis wants to focus on general cultural classifications as a background of the studied organizations. Second, the investigation of other instruments as an alternative such as Organizational Culture Inventory (OCI) which was investigated because of its popularity (Cooke & Szumal, 2000), shows that OCAI is more suitable because it is more user friendly and less lengthy (Bellot, 2011). Third, OCAI is found to be a very powerful assessment of organizational cultures and were used in large numbers of researches in different discipline, and it became one of the most used culture assessment models (Cameroon & Quinn, 2011; Suderman, 2012).

Although OCAI was developed and used for quantitative methods, however, it was used qualitatively in some studies (Aasi, Rusu, & Han, 2016). Moreover, the instrument is going to be used in two ways, the first one is in its original form and will be supplied within the interviews where respondents will be asked to complete the assessment as part of the interview in order to gain a general assessment of the organizational cultural background. The second way is by adapting OCAI dimensions and use them as part of the interview guide, which allows to gain detailed information about the studied phenomena.

OCAI assessment consists of six dimensions, each of them has four possibilities where the respondents supposed to distribute 100 points among them, later on, the average of each answer is calculated, and the result is plotted into the CVF (Cameroon & Quinn, 2011). The six dimensions of OCAI as per (Cameron & Quinn, 2006; Cameroon & Quinn, 2011):

Dominant characteristics: Identifies the main characteristics of the organization, such as being a family type organization, dynamic, result oriented, or a controlled and structured place.

Organizational leadership: Identifies the leadership focus of an organization, such as focusing on mentoring, innovation, result oriented, or coordinating and organizing.

Management of employees: Identifies employees management characteristics in the organization, such as teamwork, individual risk-taking, high demands or predictability, and stability in relationships.

Organizational glue: Identifies bonds that hold the organization together, such as loyalty, commitment to innovation and development, goal accomplishment, or rules and policies.

Strategic emphasis: Identifies the main emphasis of the organization such as trust and openness, creating new challenges and obtaining resources, competitive actions or efficiency and control.

Criteria for success: Identifies what is considered success in the organization, such as human resources development, being product leader and innovator, winning in the marketplace or reliable delivery.

2.2.5 Competing Values Framework (CVF)

The CVF (see Figure 2.4) is used in this thesis to categorize cultures in organizations. It was created originally to assess organizational effectiveness as Campbell et al. (1974) created 39 measures for organizational effectiveness. Quinn and Rohrbaugh (1983) submitted the 39 measures into a statistical analysis, which resulted in the creation of three dimensions, which are according to Quinn and Rohrbaugh (1983):

- The first dimension is related to organization focus from internal focus and the development of people in the organization to an external focus on the development of the organization itself.
- The second dimension is related to organizational structure, where organizations either focus on stability or flexibility.
- The third dimension emphasizes organizational means and ends, from an emphasis on processes to an emphasis on productivity.
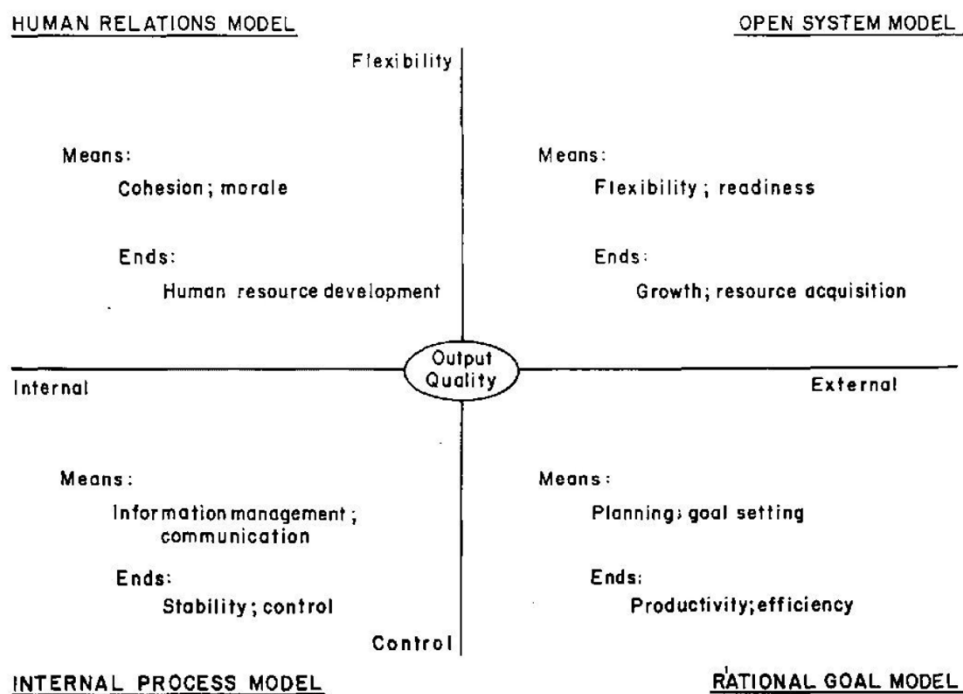
Figure 2.4: The competing values approach (Quinn & Rohrbaugh, 1983, p. 369)

The first two dimensions creates four quadrants that represent different effectiveness indicators and categories, and form the CVF that represent cultural orientation (Figure 2.5) which are According (Cameron & Quinn, 2006; Cameroon & Quinn, 2011):

Clan Culture (Collaborate):
Organizations of this type are close to family type organizations and characterized as a friendly place to work in, with a commitment to employees. Management empowers employees and facilitate their participation. Their long terms concerns are employee development and morale. Organizations of clan type are usually internally oriented, and their internal controls are based

on loyalty and traditions. An example of such organizations is PeopleExpress airlines in the USA.

Adhocracy Culture (Create):
Derived from the word ad-hoc, which means temporary, specialized, and dynamics. Organizations of this type are characterized as dynamic, entrepreneurial, and creative workplace which accept information overload and ambiguity. The leadership is visionary, innovative, and risk-oriented. While their long-term concern is rapid growth and acquiring resources. Organization orientation is external, and the internal controls are based on a commitment to experimentation and innovation. This type of organizations believes in innovation as the way to success. Besides, organizations are future-oriented, and the role of management is to enhance creativity. An example of adhocracy companies can be found in software development companies.

Market Culture (Compete):
Result oriented workplace with a focus on transactions. This type of organization functions as a market itself, where core values for organizations are competitiveness and productivity. The leadership role is to drive organizations to productivity and leaders are hard driving producers, demanding and tough. Organizations in this category are externally oriented and their core values are competitiveness and productivity, and internal controls are economic market exchange. They assume that the external environment is hostile as customers are choosy and interested in value. Their long-term concerns are competitive actions and achieving goals. Additionally, they identify success in terms of market share and competitiveness. An example organization of this type is General Electric.

Hierarchy Culture (Control):
A formalized and structures organization, people are governed with firm procedures and leaders are coordinators and organizers. Their long-term concerns are stability and predictability, and efficiency. Moreover, they have an internal orientation. Example organizations of this type are McDonalds and Ford Motors.
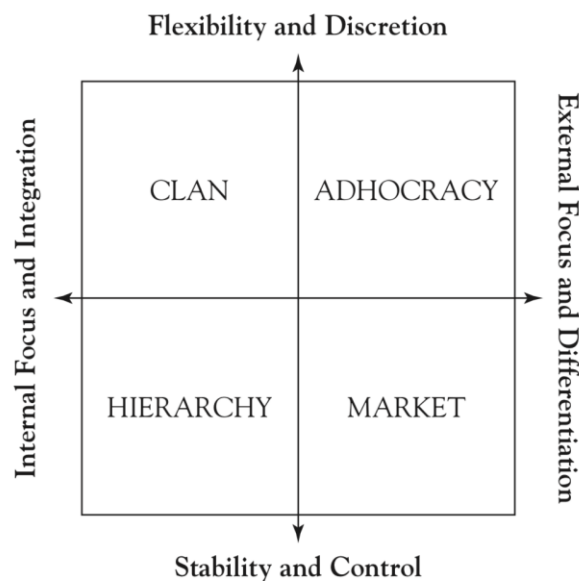

Figure 2.5: The CVF (Cameron & Quinn, 2006, p. 35)

Nevertheless, using typologies to assess cultures have some limitations, as several researchers criticized it. For instance, Jung et al. (2009) state that typologies stereotype different types of cultures or invest them with moral valence as they state different categories which contradict one of the key anthropological perspectives of culture as a value-neutral concept. Besides, Schein and Schein (2017) state that typologies are abstract in a way that they do not reflect the reality of the phenomenon, and being too simple that force oversimplifying of different details to comply with the typography. Furthermore, Schein inferred that typographies are more useful to compare several organizations than to study in depth particular organizational aspects in one organization. However, the CVF is used in this thesis to assess culture because typologies have been urged to allow placement of observation into a norm or patterns that constitute the cultural model (Schein & Schein, 2017), and this is strongly needed for this research as it is necessary to identify the organization dominant culture with their impact on the CSFs of BDA implementation. Moreover, The CVF was found to "have a high degree of congruence with well-known and well accepted categorical schemes that organize the way people think, their values and assumptions, and the ways they process information" (Cameroon & Quinn, 2011, P33). Finally, the framework was validated by several studies as a powerful measure of organizational culture, and it was found as both valid and reliable (Howard, 1998; Lamond, 2003).

2.3 Summary

In the theoretical background work, the concept of BD and BDA in addition to its main characteristics that differentiate it from other technologies such as BI have been clarified. Besides, the definition of organizational culture and CSFs have been investigated, and the importance of organizational culture to the success of BDA implementation has been discussed. Besides, based on the theoretical background, the following has been identified :

- The CVF is selected as a method to categorize organizational culture after defining and discussing the advantages and disadvantages of the CVF.
- The OCAI assessment is selected as an instrument to assess the current and preferred organizational culture and to gain insight into the background of the interviewed organizations.
- The OCAI dimensions are selected to be adapted and used as part of the interview guide.
- The CSFs of BDA were investigated and identified based on the literature review.

To clarify the research, the following initial conceptual model is created (see Figure 2.6), which shows the relationship between cultural dimensions, organizational culture and the CSFs of BDA. It is good to note that several studies investigate organizational culture impact on IS using the CVF and OCAI dimensions such as Aasi et al. (2016) whom studied the impact of organizational culture on IT Governance. However, the presented conceptual model use OCAI cultural dimensions to measure organizational culture type and its impact on the CSFs of BDA.
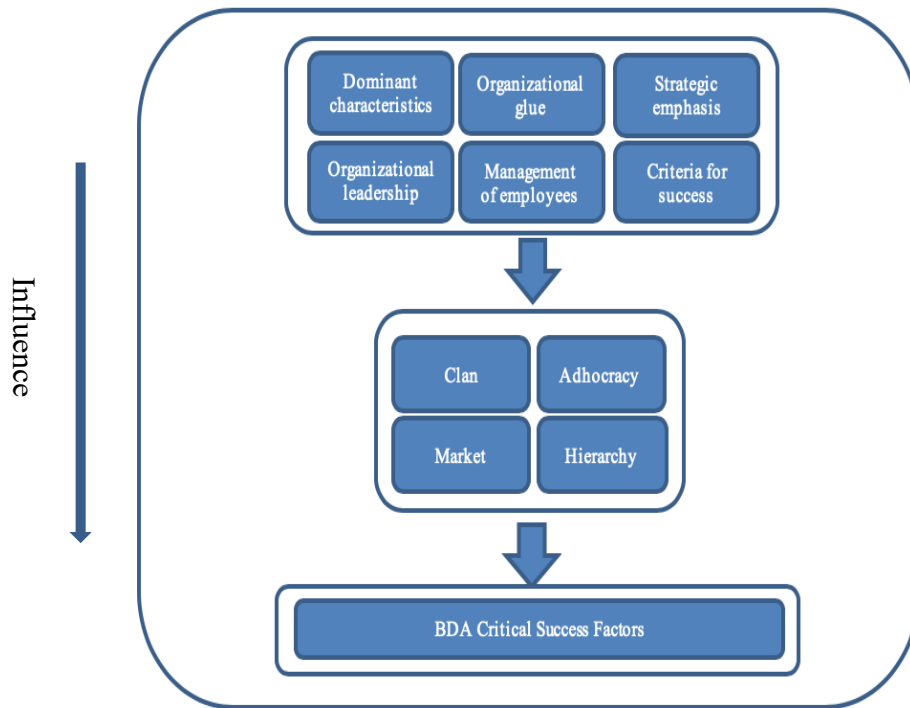
Figure 2.6: Conceptual model

3 Research Methodology

This chapter presents the motivation for the research methodology including the research approach, data collection methods, the design of the interview guide, and the selection of respondents. Moreover, it presents the principles to conduct the interviews in addition to the methods of data analysis. Finally, it discusses the quality and ethical issues for the research.

Since in this thesis we discuss BDA implementation in organizations, and our focus is on the cultural aspects of the organization, we could say our research tries to investigate a phenomenon within a real-life context. Qualitative methods are ideal for such research, and hence, we decide to adopt qualitative research (Recker, 2013). Besides, as mentioned in the introduction part, the research question focuses on a phenomenon that is not well researched. That is, our research is exploratory. Exploratory research is usually conducted to investigate new areas (Bhattacherjee, 2012). By conducting exploratory research, we could understand the scope of the nature and extent of the problem, gain initial knowledge and find out whether it is feasible to conduct more extensive research (Bhattacherjee, 2012). Qualitative methods are well suited for exploratory research because they could reveal complex, multifaceted and hidden phenomenon and help researchers gain broad and multi-perspective views (Recker, 2013).

Ontologically, we study the CSFs in the context of organizational culture, and we think those CSFs of BDA implementation cannot be isolated from the context. This is aligned with the requirement of qualitative research since qualitative research helps researchers understand the phenomenon in context (Bhattacherjee, 2012). Epistemologically, in qualitative research, the best way for researchers to study social reality is through subjective interpretations within the socio-historic context (Recker 2012). Hence, our research will employ an interpretivism paradigm and be conducted through the subjective interpretation of participants involved (Bhattacherjee, 2012).

3.1 Research approach

This thesis investigates how organizational culture would affect the CSFs of BDA implementation. The research process begins with a literature review. The goal of the literature review is to find the research gap and find the domain of interest. As Bhattacherjee (2012) suggests, there are three primary purposes of the literature review: (1) to know the current state of knowledge in the area of interest, (2) to identify the leading articles, theories, and authors and recent findings in that area, (3) to spot the gap of the research area. By conducting the solid literature review, we have gained an understanding of (1) what is organizational culture, (2) the measurement of organizational culture, and (3) the CSFs of BDA implementation. This research approach is in line with our research framework in the theoretical background part. Next, we would like to interview experts in BDA implementation and try to find how CSFs of BDA implementation are depended on the dimensions of organizational culture. We use interviews to address our research question because interviews could target the selected topic and provide us with causal inference and insightful ideas perceived by interviewees (Recker, 2013).

3.2   Data collection methods

Interviewing is the most prominent form of empirical data collection in qualitative research (Recker 2012). In our research, we invited several experts in BDA implementation as our interviewees. Another reason to conduct interviews is our argument that CSFs of BDA implementation and dimensions of organizational culture are not easy to understand for respondents. Interviews can give us the opportunity to clarify the issues related to the understanding of CSFs and dimensions of organizational culture (Bhattacherjee, 2012).

According to Bhattacherjee (2012), there are three forms of interview: (1) face to face interview; (2) focus group; (3) telephone interview. We decided to choose a face-to-face interview and a telephone interview. The face-to-face interview features synchronous communication in time and place (Opdenakker, 2006). Also, the face-to-face interview allows us to save time since there is no significant time delay between the interviewer and interviewee (Opdenakker, 2006). Telephone interview allows us to reach experts without geographical concerns (Opdenakker, 2006) since some of our respondents are from China and Canada. Besides, the telephone interview also features synchronous communication of time, which means time can be saved while collecting data (Opdenakker, 2006).

As our research tries to investigate how organizational culture would affect the CSFs of BDA implementation, we decided to conduct an exploratory semi-structured interview. The benefits for us to use semi-structured interviews are (Bhattacherjee, 2012), (1) semi-structured interview encourages two-way communication which would make interviewees feel more comfortable during the interview; (2) we can confirm what we already know and learn new knowledge; (3) the semi-structured interview progresses with flexibility because new questions may be come up with and interviewees may talk about other facts that may be significant for our research (Kvale, 2006). Thus, interesting and unexpected results may be found in our research through a semi-structured interview.

3.3   Design of the interview guide

Before we collected information, an interview guide that covers the key topics and questions is designed (Guion, Diehl, & McDonald, 2001). A formalized interview guide could help us to guarantee the consistency and stay on track during the interview with different interviewees (Guion et al., 2001). Hence, we decided to use the same interview guide to all interviewees. Our interview guide (Appendix B) is designed based on our research framework (Figure 2.3) In our research, the interview guide consists of two parts:
- General information: in this part, we will briefly introduce ourselves and the theme of our research. Issues related to ethics are also notified in this part. Then, we will let interviewees talk about some background information such as their company, their job responsibility and the situation of BDA implementation in their company. Most importantly, the OCAI test is conducted in this phase to understand their organizational culture. The primary purpose of this part is to collect background information of the interviewees and assess the organizational culture of their company. We also created an excel sheet as a tool to facilitates conducting OCAI cultural test and generate the results on the fly during the interview (Appendix H).

- CSFs and Organizational culture: this is the main part of our interview. The interview questions of this part are related to the research framework (Figure 2.3). We adapted the six dimensions of OCAI test into our interview questions and the interviewees are asked to evaluate how CSFs of BDA implementation is affected by the dimensions of organizational culture. In doing so, we can understand how different organizational cultures leverage CSFs in a more nuanced way since dimensions are more concrete and specific than culture. All our interview questions are open-ended and thus, unexpected and interesting findings may emerge, which would definitely contribute to the value of the research.

Table 3.1 shows how the interview questions are linked to the constructs from the theoretical research framework. For every construct in the research framework, we created one or several questions to investigate. In doing so, the rigor of this thesis increases.

Table 3.1: The research framework and interview questions.

Research Framework Constructs	No.	Questions
Critical success factors	3.	What are the main success factors of BDA in your company?
Dominant Characteristics & CFSs	4.	How would you describe your company's dominant characteristics?
	5.	How do you think that the dominant characteristics of your company culture influence the success of BDA?
	6.	What do you think could be the preferred characteristics of the company that impact the success of BDA? Why?
Organizational Leadership & CSFs	7.	How would you describe your company's organizational leadership?
	8.	How do you think the leadership style in your company influence the success of BDA?
	9.	What do you think could be preferred organizational leadership that impact the success of BDA? Why?
Management of Employees	10	How would you describe your company's management of employees?
	11	How do you think that the management of employees in your company influences the success of BDA?
	12	What do you think could be preferred employee management that impacts the success of BDA? Why?
Organizational Glue	13	How do you describe the glue (or bond) that holds the organization together?
	14	How do you think that the type of glue that holds the organization together influence the success of BDA?
	15	What do you think could be preferred organizational glue that impact the success of BDA? Why?
	16	How do you describe the strategic emphasis for your company?

Strategic Emphasis	17	How do you think that your company strategically emphasize values that influence the success of BDA?
	18	What do you think could be preferred characteristics that impact the success of BDA? Why?
Criteria of Success	19	How do you describe the criteria for the success of your company?
	20	How do you think that the criteria of success in your company support the success of BDA implementation?
	21	What do you think could be preferred success criteria that impact the success of BDA? why?

After we finished the interview design, we conducted a pre-interview. By performing the pre-interview, the problematic circumstances may emerge (TurnerIII, 2010). Hence, it became possible to revise, refine and optimize the interview guide to ensure that the interview guide is well-organized and covers all the related research factors. In doing so, the interview could provide maximum benefit to the research (TurnerIII, 2010).

3.4 Selection of respondents

Since our research focus on the BDA implementation which requires expertise in this field, and non-expert will not give us a useful opinion, we decided to adopt expert sampling in our research. Expert sampling allows experts who are more familiar with this subject provide us with more credible opinions and ideas (Bhattacherjee, 2012). Hence, the qualified respondents must have direct experience of BDA implementation and have the ability and willingness to answer our questions accurately and adequately (Bhattacherjee, 2012). Furthermore, a diversity of perspectives should be presented in the selection of respondents (Bhattacherjee, 2012). Hence, we will carefully select respondents at different organizational levels, departments, and positions.

3.4.1 Informant A – TerraNet AB, Sweden

Informant A (Appendix C) is in charge of a project which concerned with positioning based on the wireless signals for drone aircraft. TerraNet AB is a world leading software company in Sweden whose vision is to enable an uninterrupted user experience for everyone regardless of internet connectivity. Informant A has been working in the field of wireless communication for 12 years, and recently he has been focusing on applying BDA in the analysis of wireless signals for drone aircraft to generate insightful ideas about optimizing the designing of the drone aircraft.

3.4.2 Informant B – Intel, Canada

Informant B (Appendix D) is a silicon designer at Intel. As the world's second largest and second highest valued semiconductor chip manufacturer, Intel supplies processors to many leading computer companies like Apple, Lenovo, and HP. However, Intel is not just a proces-

sor-manufacturer and their interests include among others cloud computing, IoT and 5G connectivity. Informant B has been working as the silicon designer at Intel, and he applies BDA to optimize his designing to reduce the costs.

3.4.3   Informant C – Yuanben Blockchain, China

Informant C (Appendix E) is a project manager of a blockchain project in Shanghai, China. Informant C works for Yuanben Blockchain Company. Yuanben Blockchain adopts blockchain technology to achieve copyright protection on the Internet. Informant C combines a collection of new technologies such as BDA, AI, and blockchain to create a platform to protect the copyright of news, music, novels, and videos in China.

3.4.4   Informant D – Anonymous, Sweden

Informant D (Appendix F) is a data scientist in a world top 500 company in Sweden. Informant D gained his Doctor of Philosophy at KTH Royal Institute of Technology. He was hired by this company because of his rich experience in BDA. Supply chain management is a crucial part of this company, and they regard BDA as a new opportunity to empower the supply chain. As a data scientist, informant D's main job is to optimize supply chain management with BDA.

3.4.5   Informant E – AdBridge, China

Informant E (Appendix G) is a project manager in an online advertising company in Hangzhou, China. She has been working in this company for five years. Her company, AdBridge, adopts data technologies to find patterns of information searching behavior from large volumes of data to target users for their advertisement customers. Recently she has started a BDA project to find new opportunities in this market.

3.5 Conducting the interviews

After we successfully gained permission for interviewing, we started to prepare for the interviews. First, we carefully read the information about the respondents and their company information so that we could have a useful discussion based on shared vision about their role in BDA implementation. Next, we sent our interview guide to the interviewees before we conducted our interviews. In doing so, they can understand our interview questions and research topic more clearly, which could facilitate the discussion during the interview. Besides, some of our respondents are Chinese and they preferred to be interviewed in Chinese. However, all of them claimed that they can read and understand the interview guide which is written in English. Hence, we did not translate our interview guide into Chinese. Furthermore, it is suggested to use the mother tongue of the interviewees for conducting interviews (Fontana & Frey, 1994).

We had some principles to conduct our interview.

1. Speak in an imperative and confident tone to start the interview (Bhattacherjee, 2012).

2. Start with easy to answer questions and move to ones that are more difficult to answer since it could slowly build trust and confidence with the interviewee (Jacob & Furgerson, 2012).
3. No big words or jargon are used (Bhattacherjee, 2012).
4. Using prompts and probing techniques such as silent probe and asking for elaboration to elicit a more thoughtful and thorough response ((Bhattacherjee, 2012; Jacob & Furgerson, 2012).
5. Keep it focused in case the respondents go too far from the question we asked (Jacob & Furgerson, 2012).

All the interviews were recorded for further transcribing and analyzing. We also revised our interview questions if we found some questions as not clear or suitable after each interview. Table 3.2 shows the summary of the conducted interviews.

Table 3.2: Conducted interviews

Company	Job position	Interview Date	Interview Type	Location
TerraNet AB	Project Manager	07 May 2019	Face-to-face	Sweden
Intel	Silicon Designer	09 May 2019	Telephone Call via WeChat	Canada
Yuanben Blockchain	Project Manager	10 May 2019	Telephone Call via WeChat	China
Anonymous	Data Scientist	11 May 2019	Face-to-face	Sweden
AdBidge	Project Manager	12 May 2019	Telephone Call via WeChat	China

3.6 Data analysis

To analyze the interview data, the first step is the preparation of raw data files. In this phase, we would transcribe our interview. We adopted the online transcribe tool Xunfei to help us finish transcribing since the voice transcription techniques could help us to save time so that we can focus on analyzing the data. Then, we checked the completeness and correctness of the transcripts. Particularly, as McLellan, Macqueen, and Neidig (2003) suggest, we would not eliminate elisions, mispronunciations, slang, grammatical errors, non-verbal sounds (such as laughter) and background noises. In doing so, we could ensure that the transcripts are generated systematically (McLellan et al., 2003). Since all the interviews were conducted in Chinese, and the thesis is written in English, the interview content would be translated into English after transcribing work. To make the transcripts easy to read, a standard format for the transcript is required for both manual and computer-assist coding (McLellan et al., 2003; Thomas, 2003). Next, we performed a close reading of the text. Both of us read carefully and thoroughly the transcript to be familiar with the content and gain an understanding of the concepts and themes.

After we finished the preparation work, we started to analyze data. As Recker (2013) suggests, one of the significant features of data analysis in qualitative research is large volume data needs to be analyzed without a clear understanding of the relationship between different datasets. Hence, we decided to strictly follow the guide given by (Miles & Huberman, 1984) to analyze the interview transcripts. This guide includes three procedures: data reduction, data display, and conclusion drawing and verification (Miles & Huberman, 1984). Through data reduction, we selected sentences from the interview transcripts, focused on it, and transformed the raw data in a way that we can draw conclusion from (Miles & Huberman, 1984). According to Miles and

Huberman (1984), data reduction can be through coding since coding is a useful technique to reduce qualitative data into useful information. Accordingly, we use coding to identify themes for the interviews as we created several codes that we derived from the research questions and theoretical background. NVivo 12 was used as a tool for coding. The interview transcripts were imported to NVivo 12, and several nodes of codes were created to enable the comparison between various respondents and find relationships, similarities, and differences (see Figure 3.1).
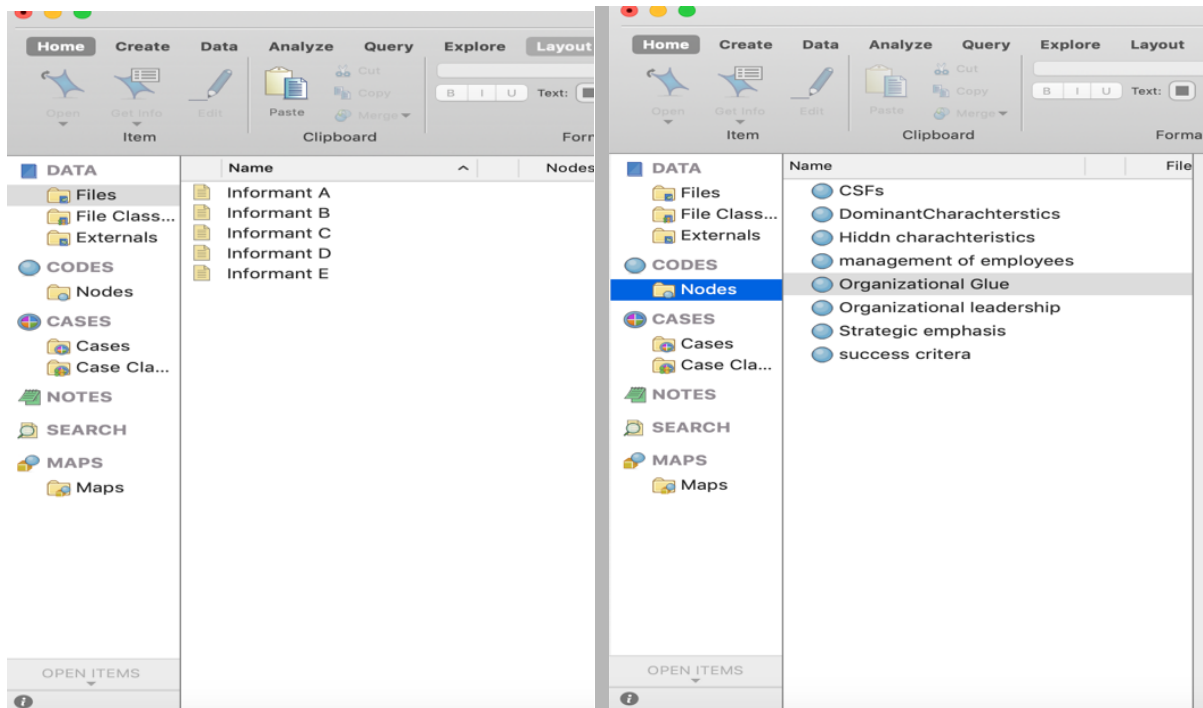
Figure 3.1: Importing transcripts and coding using Nvivo 12

After data reduction, we performed data display. In this way, we assembled the information in a well-organized way. Finally, based on the data reduction and data display, we performed the analysis to draw meaningful conclusions. Data display, conclusion drawing, and verification would be presented in Chapter 4.

3.7 Research quality and ethics

3.7.1 Research rigor

Since our research is interpretive research, the positivist notion of rigor, such as reliability and validity, is not suitable for it (Bhattacherjee, 2012). Hence, we decided to adopt the set of criteria provided by Lincoln and Guba (1985) as suggested by Bhattacherjee (2012).

Dependability

Dependability is similar to the notion of reliability in positivist research (Bhattacherjee, 2012). Like reliability, dependability requires the same conclusion should be arrived by two independent researchers assess the same phenomenon using the same set of evidence (Bhattacherjee,

2012). To achieve dependability, we provided sufficient details about the phenomenon of interest, and the social context of the phenomenon so that the readers could verify the conclusion of the research (Bhattacherjee, 2012).

Credibility

Credibility is parallel to the notion of interval validity in positivist research (Bhattacherjee, 2012). Credibility means we should make the inferences in this thesis convinced by readers. To ensure credibility, we would comprehensively demonstrate the data collection techniques, data analysis procedures (Such as verbatim transcription of interviews), detailed background information of respondents, and clear description of our theoretical and methodological decisions. In doing so, the credibility of the research could be supported by independent audits of data collection and analysis (Bhattacherjee, 2012).

Confirmability

Confirmability represents the extent to which the findings reported in research can be independently confirmed by participants (Bhattacherjee, 2012). That is, the findings of the research would be viewed as confirmable if the respondents agree with the inferences elicited from it. Hence, we shared the findings of our research once we finish the analysis part, and we would ask them to what extent they would agree with the research results.

Transferability

Transferability is akin to external validity in positivist research (Bhattacherjee, 2012). Transferability means to what extent the research findings are transferable to other settings (Bhattacherjee, 2012). We are clear that for a qualitative study, generalizability or transferability can "never be fully justified since the findings are always embedded within the context" (Polit & Beck, 2010, p. 1452). However, Payne and Williams (2005) argue that a broad range of evidence should be given to sustain generalizability in a qualitative study. Hence, we tried to provide a detailed description of the research context such as the background information of the organization (Bhattacherjee, 2012). Besides, we would also fully disclose the structures, assumptions, and process of obtaining the findings from the data. In doing so, readers could independently assess how much the reported findings could be generalized to other settings (Bhattacherjee, 2012).

3.7.2 Research ethics

Research ethics refers to the standards of conduct of a given profession or group (Bhattacherjee, 2012). Research ethical norms need to be followed so that science could be avoided being manipulated in immoral ways (Bhattacherjee, 2012). We followed the ethical principles suggested by Bhattacherjee (2012) in this thesis.

Voluntary participation and harmlessness: Before we conducted the research, we informed the respondents that their participation in this thesis is voluntary, and they always have the freedom to withdraw from the research at any condition. Also, we informed them that no unfavorable consequences would be caused(Bhattacherjee, 2012).

Anonymity and confidentiality. In our thesis, we would protect the subjects' interests and future well-being by protecting their identity. We asked them whether they need to keep their names or their companies' names anonymous at the end of the interview. Also, we would ask for their permission to record the conversation before we start the interview. We would protect the participant's privacy based on their willing (Bhattacherjee, 2012).

Disclosure. While we contacted the respondents, we will briefly introduce the primary purpose and goal of our research so that they could decide whether or not to take part in the research. Before we started to conduct the interview, we sent the interview guide to them to help them to further confirm whether they wanted to participate in this research process (Bhattacherjee, 2012).

Analysis and reporting. Researchers need to fully report to the scientific community on how the data is analyzed (Bhattacherjee, 2012). The unexpected findings which may question the research design should also be fully disclosed (Bhattacherjee, 2012). We followed this rule and created traceability and transparency by providing our interview guide (Appendix B), transcripts of the interviews (Appendixes C, D, E, F & G), and the coding process.

4 Empirical Findings and Analyses

This chapter includes the analysis of data, such as the identification of background cultural orientation for respondents' organizations and the analysis of interviews.

4.1 Respondents' cultures

The cultures of interviewees' companies differ considerably (Table 4.1). The conducted OCAI test which measures the current and preferred cultures, shows different cultures for the interviewed companies. The details of the current and preferred cultures are demonstrated in Figure 4.1, which shows clearly how the cultural orientation of the interviewed companies vary.

Table 4.1: Respondents dominant cultures

Company	Respondent	Current culture	Preferred culture	The aim of BDA implementation	Stage
TerraNet AB	RespA	Adhocracy and market	Adhocracy and market	Analyze the Location Data	Beginning
Intel	RespB	Mainly hierarchy	Hierarchy and mixed	Circuit Design	Beginning
Yuanben Blockchain	RespC	Clan and adhocracy	Adhocracy	Blockchain	Mature
Anonymity	RespD	Mixed, mainly clan and market	Mixed, mainly adhocracy and market	Supply Chain Management	Mature
AdBirdge	RespE	Adhocracy and market	Mixed, mainly market	Online Advertising	Beginning
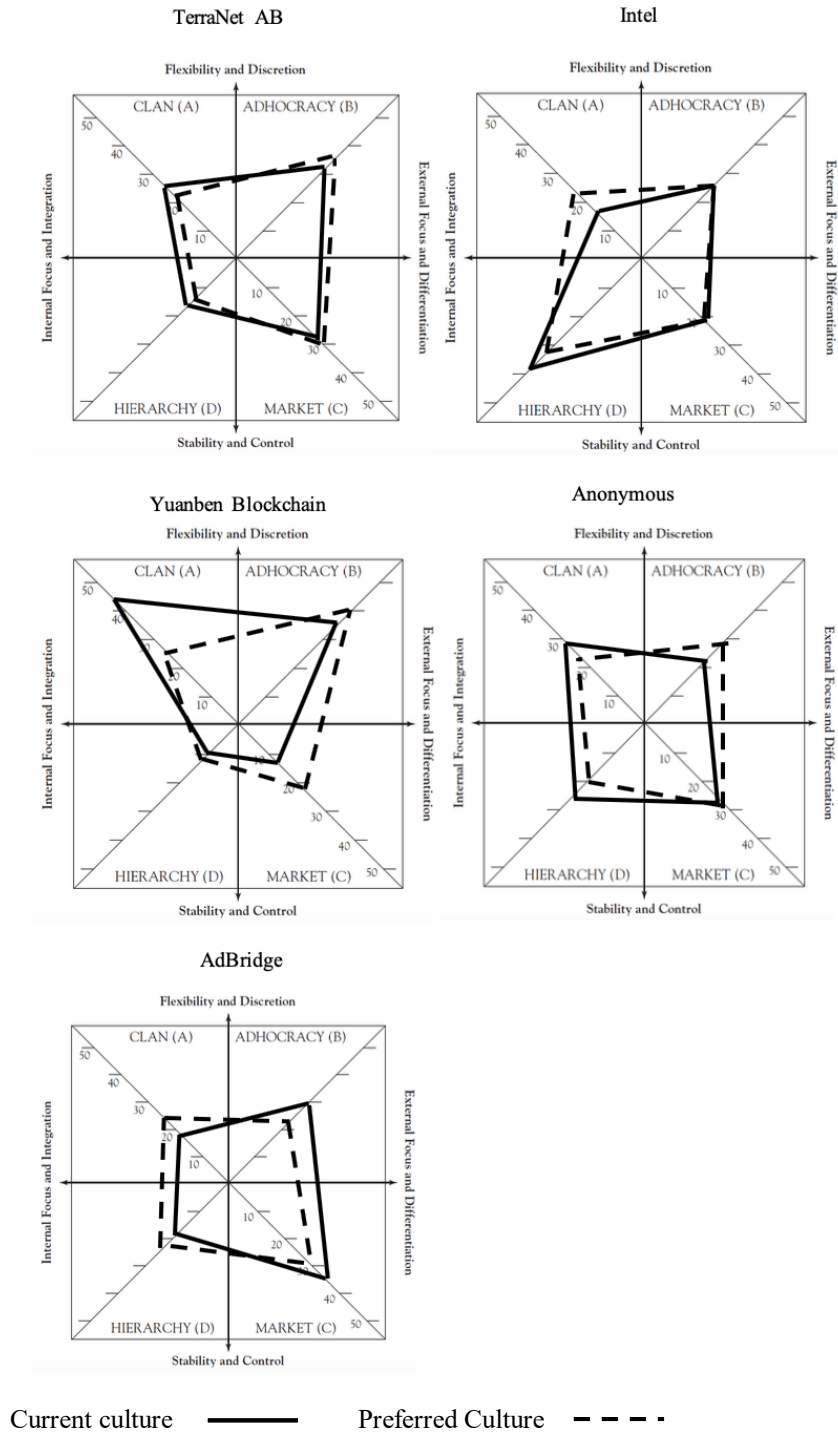
Figure 4.1: Respondents cultural assessment

4.2 Culture dimensions and the impacted CFSs

According to (Miles & Huberman, 1984), data display in qualitative analysis can be achieved using several ways such as descriptive figures, explanatory figures and descriptive matrices which aim to eyeball data to enable performing detailed analysis. Thus, we created the following matrix that displays cultures with their related dimensions and impacted CSFs.

Table 4.2: Cultural dimensions and the impacted CSFs matrix

Culture	Dimensions	The impacted CSFs
Adhocracy	Dominant characteristics	Vision
		Leadership support
		Technology
		Skills
	Organizational leadership	Leadership support
		Technology
		Free experimentation
		Skills
	Management of employees	Free experimentation
		Vision
		Skills
	Organizational glue	Vision
	Strategic emphasis	Skills
		Change management
	Criteria for success	Vision
Clan	Dominant characteristics	Vision
		IT-business collaboration
	Organizational leadership	Skills

		Information sharing culture
	Management of employees	Collaboration
		Information sharing culture
		Skills
	Organizational glue	Trust Culture
		Information sharing culture
		Communication
	Strategic emphasis	Trust Culture
		Communication
		Change Management
		Leadership support
	Criteria for success	Skills
Market	Dominant characteristics	Vision
		Leadership support
		Skills
		Technology
	Management of employees	Skills
	Organizational glue	Vision
	Strategic emphasis	Vision
	Criteria for success	Vision
Hierarchy	Organizational leadership	Organizational structure

		Vision
		Collaboration
		Process
	Management of employees	Organizational structure
		Skills
	Strategic emphasis	Organizational structure
		Process
	Criteria for success	Vision

4.3 Analysis of empirical findings

4.3.1 Dominant characteristics

Adhocracy Culture

- Mentioned by RespA RespD and RespE
- Impacted CSFs: **Vision, Leadership support, Technology, and Skills.**

The adhocracy culture according to Cameron and Quinn (2011), is a more dynamic entrepreneur and risk-taking, which is supported by RespA(22), RespD(12) and RespE(12).

Within the adhocracy culture, the need for technology and innovation is a key driver for companies adopting BDA. Interviews show the importance of **vision** to understand the potential value of BDA before investing resources (RespD: 12). Additionally, achieving technological innovation improves **leadership support** as it requires the management to be more positive toward BDA which affects the attitude of the entire company in addition to its support to BDA with knowledge and resources (RespA: 26). Furthermore, adopting new technologies raises the need for **skills** which is affected positively as a result of company's investments in learning to cope with the new technologies (RespD: 12), and to the efforts invested in keeping the employees motivated to improve their **skills**, RespE (14) stated that "not everyone are willing to learn new things, to make changes. So, if you want to make BDA a success, you need your employees to be very well-motivated".

Pursuing a more dynamic and innovative culture (RespA:30; RespB: 26; RespD:14) is preferred, as it increases employee motivation toward BDA as a direct result of the company's

positive attitude toward it. Combining this attitude with the **leadership support**, the **skills** and **technology** adoption is improved, "you say to your employees that they have to constantly update their knowledge structure, or they have to adopt the latest technology, they will learn more about BDA" (RespA: 30).

Clan Culture

- Mentioned by RespC, RespE
- Impacted CSF: **Vision, IT-business collaboration**

The clan culture according to Cameron and Quinn (2011) is a personal place like an extended family, and this is supported by RespC (8).

This type of culture has a positive impact on **vision** regarding BDA, this is illustrated by RespC (10) who states that "I think it could stimulate the subjective initiative of employees so that It is easier to implement BDA from bottom to top".

Clan characteristics are preferred by RespE (18) because they improve collaboration, specifically **IT-business collaboration**, RespE (18) stated "if the relationship between each department could be improved or even become more harmonious, our efficiency will be greatly improved. Then…for example, the relationship between our finance department and our business department is not very good"

Market Culture

- Mentioned by RespA, RespC, RespD, and RespE
- Impacted CSFs: **Vision, Leadership support, Skills, and Technology.**

The market culture according to Cameron and Quinn (2011) is a result, achievement, and competitive oriented.

The competitive and result-oriented nature of this culture reflects on the CSFs. Firstly, it impacts leadership **vision** positively, this is illustrated by RespD (12) as they state, "you need to think how do you transfer the knowledge to the products or practice it in reality, that is, how this knowledge will add value?". Secondly, it impacts **skills** positively because of the strong **leadership support** to learn new technologies to be competitive, as they stated, "we can lead everyone in the company to learn new things together" (ResA: 26).

Market culture characteristics are preferred because, in the first hand, it improves **vision,** since market needs encourage the company to understand the market and customer, and on the other hand it improves **technology** as a result of the company's willingness to be more competitive (RespC: 12).

4.3.2 Organizational leadership

Adhocracy Culture

- Mentioned by RespA, RespD, RespE
- Impacted CSFs: **Technology, Leadership Support, Free Experimentation, and Skills**

The adhocracy culture organizational leadership, according to Cameron and Quinn (2011), is the leadership that exemplifies entrepreneurship, innovation, and risk-taking which is supported in RespA (32) and RespE(22).

As an innovation-oriented, the organizational leadership under adhocracy culture improves **technology** and **leadership support** as illustrated by RespA(34) who states, "the leader will encourage you to adopt some newer… newer technologies in the industry", and by RespE(24) who states "that's how we encourage our employees to learn BDA". The leadership support fosters **free experimentation** culture with more tolerance for failures, and consequently, employees learn more and become more **skilled** (RespE: 24).

Additionally, it would be better for organizational leadership to move toward more **free of experimentation** environment as elaborating BDA helps the company to have long term **vision**, RespD(20) stated " we need the freedom to think in the long run, I mean our goal cannot be limited to this year or next year". Further to this, innovation and risk-taking are not unnoticed; they are essential to elaborate BDA and tackle its ambiguity the arises from its novelty (RespD: 20).

Clan Culture

- Mentioned by RespC, RespD
- Impacted CSFs: **Information sharing, Skills**

This type of organizational leadership according to Cameron and Quinn (2011) is the leadership that exemplifies mentoring, nurturing and facilitating, which is supported by RespC (14) and RespD (16).

Interviews reveal that this style of leadership enhances employee loyalty and morals as they will be more motivated for the company, this is supported by RespC (18) as they stated, "she will regard the company as a part of herself and will devote themselves more". Besides, the core philosophy behind the clan culture is employee development, which encourages companies to train their employees and motivate them to **share their information** to disseminate knowledge, which ultimately improves **skills** (RespD: 18)

Hierarchy Culture

- Mentioned by RespB, RespD and RespE
- This characteristic influences the following CSFs: **Organizational structure, Vision, Collaboration, and Processes**

The hierarchy culture leadership according to Cameron and Quinn (2011), is the leadership that exemplifies coordination, organizing and smooth running, which is illustrated by RespB (28).

As a hierarchy type culture, **organizational structure** is in effect, which makes it easier to perform job, with more clear and less error-prone tasks, this is supported by RespB(30) who stated that "most of our decision is made according to the rules in our organization, so chances are low for personal error", and stated "For example, our bottom level employee will be assigned smaller and clearer jobs, which will make it easier to finish the task". Further to this, a structured management style affects the **vision** in the organization, because management

can align employees toward the shard business goals and consequently, employees **collaborate** to achieve these goals (RespD: 18).

Besides, hierarchy culture characteristic would be suitable to achieve better efficiency in **processes** as an important factor for the success of BDA. For example, efficiency allows the company to be more effective concerning time management and better exploitation of human resources, RespE (28) states that "if our company focuses more on how to work effectively within less time like 8 hours, it could be much better. I mean we would be more efficient in developing BDA in our company".

4.3.3 Management of employees

Adhocracy Culture

- Mentioned by RespA, RespC, RespD, RespE.
- Impacted CSFs: **Free experimentation, Vision and Skills.**

This type of employee management according to Cameron and Quinn (2011) is characterized by individual risk-taking, innovation, freedom, and uniqueness, and this is supported by RespE (30).

As a new technology with high failure rates, it is crucial for management to emphasize **free experimentation** so that employees understand these technologies more, gain requested **skills**, and develop a **vision** of how to generate business values from BDA, this is supported by RespE(32) as they state "in our company, we encourage our employees to explore new technologies freely, we encourage them to find how to generate value from big data", and this is strongly driven by adhocracy culture values.

Such culture with experimentation freedom is preferred by RespA(42) and RespC(35). The tackling of BDA is more complicated due to its novelty; accordingly, elaborating BDA requires **freedom of experimentation** (RespD: 26).

Clan Culture

- Mentioned by RespA, RespB, RespC, and RespD
- Impacted CSFs: **Collaboration, Skills and Information sharing.**

This type of employee management according to Cameron and Quinn (2011) is characterized by teamwork, consensus and participation. This is supported by RespB (34), RespA (38), RespC (31) and RespD (22).

Clan culture impacts several factors. Firstly, based on the culture's core values that focus on teamwork and consensus, it impacts **collaboration** in a way that employees work together openly to achieve the success of BDA (RespD: 24; RespB: 36) and base their decisions on discussion and consensus (RespA: 40). Secondly, consensus increases decision ownership, which impacts employee motivation (RespC: 33). Thirdly, it positively impacts **skills**, as employees learn through participation in knowledge **sharing** mechanisms, this is supported by RespD (24) as they stated "every employee will learn in the process of participating. Everyone is mastering new knowledge and learning from each other".

Market Culture

- Mentioned by RespB
- Impacted CSF: **Skills**

This type of employee management according to Cameron and Quinn (2011) is characterized by hard-driving competitiveness, high demands, and achievement which is supported by RespB (34).

The market culture impacts **skills**, because being competitive requires **skilled** and competitive professionals, this is supported by RespB (36) as they stated "As for competitiveness, as I said before, we need to face the market. So, we need our employees to be competitive so that they could adopt new technology".

Hierarchy Culture

- Mentioned by RespB, RespE
- Impacted CSF**: Organizational structure, skills**

This type of employee management according to Cameron and Quinn (2011) is characterized by the security of employees, conformity, predictability and stability in relationships which is supported by RespB (34) as they state, "we need also conformity of employees and stability of the organization"

The hierarchy features impact **organizational structure** because tasks are better executed according to a hierarchical model where assigned tasks are executed and reported to the upper levels, this is supported by RespB(34) as they stated "Only when employees obey rules in the company, can the task be executed from top to bottom".

In addition, hierarchy management style with a focus on the security of employment and stability can have a positive impact on employee retention, because employees prefer a stable working atmosphere over fierce competition. Ultimately, employee retention impacts the availability of the required **skills**, this is supported by RespE (36) as they state, "the competition is very fierce. If you could not keep up with our pace, then…you fail. Many people left our company because they can't adjust themselves to such culture"

4.3.4 Organizational glue

Adhocracy Culture

- Mentioned by RespA, RespB, RespC, and RespD
- Impacted CSFs: **Vision.**

The organization glue of adhocracy culture is the commitment to innovation and the emphasis on being on the cutting edge (Cameron & Quinn, 2011). RespA (46) mentions that they are connected by innovation. RespB (44), RespC (37) and RespD (28) state that their bond is to create cutting-edge products. Such culture encourages employees to share a same **vision** and to actively embrace new technologies like BDA since they want to innovate and sell the cutting-edge products RespA (48).

"because we all want to make the newest products, so we won't miss any new technologies, including big data analytics, including blockchains …"

-RespC (39)

Clan Culture

- Mentioned by RespD, RespB
- Impacted CSFs: **Trust culture, Information sharing culture and Communication**

The bond of organizations whose culture features clan is loyalty and mutual trust (Cameron & Quinn, 2011). This is supported by RespD (28). The mutual trust and loyalty could create a **trust culture** in organizations so that the team members believe each other, and the implementation of BDA could be facilitated (RespD:30).

Clan culture is preferred by RespB (46) since RespB (46) thinks the mutual trust could help to improve **information sharing culture** and **communication** in the organization, which would lead to cooperation. RespB (46) emphasizes that cooperation is vital for the success of BDA implementation.

Market Culture

- Mentioned by RespA, RespD, and RespE
- Impacted CSF: **Vision.**

The bond that holds the organizations of market culture together is the emphasis on achievement (Cameron & Quinn, 2011). Such a bond is emphasized by RespA (46), RespD (28) and RespE (38). Impacted by market culture, the goal accomplishment will stimulate employees to share a clear **vision** so that they will be well-motivated to adopt BDA(RespA:48). Moreover, RespE (40) explains that their goal for the great achievement, being a leading role in the market, forces them to develop BDA to be competitive in the market.

The organizational glue of market culture is preferred by RespA (49), RespD (32), and RespE(42). RespD (32) and RespE (42) think that they do not want to change their bond for now. In other words, they are satisfied with their organizational glue and they think such a market culture bond will continue to have a positive effect on the implementation of BDA.

Hierarchy Culture

- Mentioned by RespB

For Hierarchy Culture, formal rules and policies are the glue that holds together (Cameron & Quinn, 2011). It is supported by RespB (42) as RespB (42) states that they are linked together by rules and regulations. However, RespB (44) does not mention how such a bond could affect the success of BDA in their company.

4.3.5 Strategic emphasis

Adhocracy Culture

- Mentioned by RespA, RespB, RespD, RespE
- Impacted CSFs: **Skills and New strategy of management (change management).**

The strategic emphasis of this culture type is acquiring new resources, trying new things and creating new challenges (Cameron & Quinn, 2011). RespA (52) states that their strategic emphasis is innovation. RespE (44) also mentions finding new opportunities while talking about strategic emphasis. RespA (54) explains that the innovation of technology and **learning new skills** could help them to achieve their goals, which is confirmed by RespE(48).

Strategically trying new things is preferred by RespB (52) and RespD (38). RespB (52) expresses his opinion that BDA is a new technology and then a **new strategy of management** is required. Moreover, RespD (38) mentions BDA is developing very fast and they must learn new **skills** and knowledge in this field.

Clan Culture

- Mentioned by RespC, RespD
- Impacted CSFs: **Trust culture, Open discussion and consensus (communication), New strategy (change management), Leadership sponsorship.**

The strategic emphasis for the clan organizational culture is human development, high trust, openness, and participation persist (Cameron & Quinn, 2011). Both RespC(43) and RespD(34) emphasize openness while implementing BDA since being open-minded enables employees to embrace new technology like BDA easily(RespD:36). Moreover, **trust culture** will improve the working environment and employee satisfaction which allows them to focus on their goals.

"you don't have to worry about things like your relationship with your colleagues, and then you can focus more on your work"

-RespC (58).

RespA (56), RespB (52), and RespE (52) state that they prefer strategic emphasis of clan culture. RespA (56) emphasizes the importance of open discussion and consensus since **open discussion and consensus** facilitate the implementation of BDA(RespA:58). RespB (52), however, states that openness could help to support a **new strategy** for BDA. RespE (52) believes that the participation of mid-level or senior managers in the implementation of BDA is crucial since they need **support from leadership**.

"You know, we are not doing well in training mid-level or senior managers. Some of them even lack a basic knowledge about BDA. We need support from them, so we must let them know how important BDA is."

-RespE (52)

Market Culture

- Mentioned by RespA, RespE
- Impacted CSF: **Vision**

The strategic emphasis of market culture is competitive actions and achievement (Cameron & Quinn, 2011). This is supported by RespA (52) and RespE (44). RespA (54) states that an emphasis on achievement enables employees to focus on the shared **vision** and achieve that goal with BDA. RespE (48) thinks that the success of BDA implementation in their company results from their **vision** to be the leading company in the market.

"Exactly! If our company wants to maintain a leading position in a market, then we must learn new technologies and then create new values, that's how we become the leading company."

-RespE (48)

Hierarchy Culture

- Mentioned by RespB, RespC
- Impacted CSF: **Organizational structure, Process**

The strategic emphasis of the hierarchy organizational culture is permanence and stability (Cameron & Quinn, 2011). RespB(48) states that the strategic emphasis in their company is efficiency, control and smooth operation. Such a strategy emphasis is conducive to a clear **organizational structure** and well-controlled **process**, which would help to develop the implementation of BDA.

RespC (47) hopes their strategic emphasis could be more "hierarchical" since she wants more centralized management which would make the BDA implementation more efficient.

4.3.6 Criteria for success

Adhocracy Culture

- Mentioned by RespA, RespC
- Impacted CSF: **Perceived benefits (Vision)**

The criteria of success from this type of culture are having the most unique and newest products (Cameron and Quinn 2011). Both RespA (62) and RespC (51) emphasized new products since they think the newest products are more competitive in their own market. Hence, they adopt and develop BDA to **guarantee the novelty** of their products (RespA:62).

Clan Culture

- Mentioned by RespC and RespE
- Impacted CSFs: **Skills and Vision**

The criteria of success reported from this type of companies are teamwork and concern for people. In addition to a new product, RespC (51), by focusing on human development and **skill training,** the respondent states that they are supporting the BDA industry.

"from the perspective of the whole industry, we have trained a talent for the industry. Even if the employee leaves my company, he can still promote the development of the whole industry as long as he works in the big data industry".

-RespC (53)

Such success criteria are preferred by RespE (58) since concern for employees makes them more willing to share the **vision** of implementing BDA.

"Although we focus on Wolf Culture, we should care about our employees. You need to treat them like a family then they would like to share your vision."

-RespE (58)

Market Culture

- Mentioned by RespA, RespE
- Impacted CSFs: **Perceived benefits (Vision)**

The criteria of success from this type of culture are winning in the marketplace and outpacing the competition (Cameron & Quinn, 2011). Both RespA (60) and RespE (54) state that their criteria of success are selling more products. Winning in the marketplace means being competitive, which could be achieved by BDA since BDA is a useful method to **make their product volume supplied** (RespA:62).

RespD (44) prefer such a criterion for success since they are eager for winning in the market which would promote the implementation of BDA.

"Because we not only want to pursue low costs, we also want high profits. New technologies will bring you high profits. That's why we invest in new technology. We will get higher profits and we will earn more money. That is why we will adopt new technologies."

-RespD (44)

Hierarchy Culture

- Mentioned by RespB, RespD
- Impacted CSF: **Perceived benefits (Vision)**

The criteria of success for this type of organizational culture are achieving efficiency and low-cost products (Cameron & Quinn, 2011). This is supported by RespB (54) and RespD (40). In order to **control the costs of products and improve efficiency**, the company adopts and develops BDA since BDA could effectively optimize their designing process and reduce their cost. (RespB:56, RespB:12).

5 Discussion of Findings

This chapter presents the discussion of finding of the thesis, including the four cultures impact on the CSFs of BDA. Additionally, it presents a further discussion and the implication of finding on research and practice.

5.1 Organizational culture and CSFs

5.1.1 Adhocracy culture

This thesis found that adhocracy culture could leverage success factors such as vision, leadership support, free experimentation, skills, technology and change management. Adhocracy-type firms believe that adaptation and innovativeness could help them find new resources and gain profit. They turn their eyes to the future and attempt to prepare for the future (Cameroon & Quinn, 2011). Impacted by such culture, members in the organizations would look for new technologies like BDA in order to create new opportunities in the future. Thus, they emphasize on creating a vision of the future and developing new products and services by implementing BDA. A clear vision is important to the success of BDA implementation. Since the leadership of such culture features innovator (Cameroon & Quinn, 2011), leaders in adhocracy-type firms are more willing to embrace BDA and promote it from top to bottom. This leadership sponsorship would benefit the implementation of BDA. Besides, influenced by adhocracy culture, people are willing to take risks, for example, conducting experiments to explore how to implement BDA. Some participants mentioned the importance of free experiments while implementing BDA since BDA is a new technology and trial and error are inevitable to find a successful approach to apply BDA. The support for the freedom of experimentation would enable people to find more possibilities of BDA, and thus will benefit the success of BDA implementation. Furthermore, motivated by innovation, vision, strong leadership support, and freedom of experiment, employees are more open to change and willing to learn new knowledge and improve their skills in BDA, which would aid the successful implementation of BDA.

5.1.2 Clan culture

This thesis found that clan culture would impact CSFs like communication, IT-business collaboration, information sharing culture, trust culture, vision, and skills. This finding is in line with the features of clan-type organizations. The characteristics of such organizations are teamwork, employee involvement programs and corporate commitment to employees (Cameroon & Quinn, 2011). Impacted by clan type culture, leaders focus more on collaboration and teamwork while implementing BDA, which also means they think human development and participation are the key reasons for the success of BDA. Hence, they encourage the training of analytical skills, communication between team members, collaboration between different departments, and also a sharing culture. In addition, decisions are made based on trust and consensus. They believe that mutual trust would bring effectiveness since it facilitates collaboration and communication. Also, from the perspective of employees, such culture makes them feel they are an important part of the organization and they have loyalty to their company. They regard their company's goal as their own goal since the goal is decided based on consensus. Thus, the employees are more well-motivated and more willing to devote themselves. However, we need to

think critically about the effect of clan culture since we also find that too much emphasis on consensus would decrease efficiency, which is supported by Roberto (2004). As one participant put it "we cannot promise everyone's opinion should be respected, which is very inefficient." (RespC:57), clan culture also has a negative impact on the implementation of BDA. Since BDA is a new technology, most leaders and employees actually do not have a clear idea about BDA. In such a context, the consensus on how to implement BDA could be difficult, which would impede the progress of BDA implementation.

5.1.3   Market culture

Market culture organizations focus on winning in the market (Cameroon & Quinn, 2011). Such organizations are very aggressive. General George Patton describes market organizations as "advancing all the time, defeating the opposition, marching constantly toward the goal" (Patton, 1944). Our study found market culture could leverage factors like vision, skills, leadership support and technology. All the informants mentioned that they adopt BDA because they believe BDA could lead to innovation and enhance the competitiveness of their organization. With such a vision, people in organizations are well motivated to develop BDA. When BDA contributes to the achievement of their goals, the sense of achievement would further stimulate their interest in BDA and lead to the leaders' support. Moreover, people's eagerness for achievement in the market will drive them to improve their skills in BDA.

5.1.4   Hierarchy culture

Our findings show that hierarchy culture would leverage factors such as organizational structure, process, vision and collaboration to affect the implementation of BDA. This is in line with the characteristics of the hierarchy culture. As (Cameroon & Quinn, 2011) describe, hierarchy-type firms are characterized by a formalized and structured place to work. This type of culture usually leads to a well-organized organization structure and well-defined processes. In such an organization, a BDA project is divided clearly into several tasks that would be assigned to different departments. Furthermore, a task can be further divided into smaller and clearer sub-tasks in a department to make it easier for each staff member to finish his or her job. The leaders will focus more on the integrate and coordinate the tasks and functions of those departments. The whole process is under control. In doing so, they want to guarantee high effectiveness in implementing BDA.

5.2   A further discussion

The prior discussion shows how different cultures affect the CSFs of BDA implementation in different ways. Clan culture would stimulate factors such as skills, collaboration, communication, trust culture, and information sharing. Adhocracy culture encourages factors like vision, leadership support, free experiments, and change management. Although market culture also affects factors like vision, skills, and leadership support, the mechanism is different since market culture emphasizes on competitiveness while adhocracy culture focuses on innovation. Hierarchy culture, however, affects more on organizational structure and process. CSFs vary in different cultural contexts. Hence, we argue that the CSFs of BDA implementation should not be detached from the organizational culture context. However, CSFs presented in the current literature are selected without the organizational context. Thus, we cannot see the whole picture

of how those success factors contribute to the implementation of BDA. In this sense, our research challenges the current studies and reveals the importance of a cultural fit of CSFs.

Another interesting result from this thesis is that we found the relationship between organizational culture and BDA implementation is not merely a one-way impact; instead, it is a two-way interaction. All the respondents give their preferred choice of culture when asked to improve the implementation of BDA. For example, one respondent whose organization features clan culture expected more hierarchy-type leadership support in order to implement BDA more successfully (RespC:47; RespC:57). That is, they want some changes in their organizational culture to better develop BDA. Actually, the adoption of new technologies can lead to new cultural identities in organizations(Sankar, 1988) . Leidner and Kayworth (2006) explain that the implementation of IT would lead to a reorientation of culture values, which would influence culture over time. Hence, we argue that while longing for the success of BDA implementation, organizations would change some of their organizational culture characteristics to create a better environment for the new technology.

5.3   Implication of the findings to research

This thesis has several implications for researchers. We have shown that the literature has limited view on how organizational culture is not clearly linked to CSFs, which makes it hard to understand its impact on implementing BDA. We therefore looked into this and found that CSFs cannot be isolated from organizational culture context since different types of organizational culture would leverage different CSFs. Compared to the studies by Mardiana et al. (2018) and Adrian et al. (2017) , we further confirm that adhocracy culture and clan culture have the potential to benefit the implementation of BDA. Furthermore, we also found that both market culture and hierarchy culture have positive effects on the success of BDA by leverage CSFs such as vision and organizational structure. Besides, the results from this study imply that the implementation of BDA would affect the organizational culture.

5.4   Implication of the findings to practice

In this thesis, we also have implications for practice. We show that by identifying the type of the organizational culture, one can improve the implementation of BDA by knowing that cultural fit is important while considering CSFs. For different types of organizational culture, the CSFs of BDA may differ. For example, if the organization predominately features clan-culture characteristics, more emphasis should put on CSFs like communication, collaboration, trust, and information sharing. For adhocracy-type organizations, more attention should be paid to CSFs like free experiments and change management. However, this thesis does not encourage to view organizational culture as being stable and homogenous. In other words, characteristics from other types of organizational culture could be introduced to improve the implementation of BDA. For instance, hierarchy culture characteristics like well-defined organizational structure could enhance the efficiency of BDA implementation.

6 Conclusion

BDA has been or will be adopted by many organizations to achieve competitiveness in today's turbulent business environment (Russom, 2011). However, we have to face the fact: the success of BDA implementation is not easy to achieve. Hence, many researchers have conducted research to investigate the CSFs of BDA implementation (Cato et al., 2015; Gao et al., 2015; Sun et al., 2018). Yet, those studies do not take culture fit into account while summarizing the CSFs. In this thesis, we have shown that organizational culture plays an important role in affecting the CSFs of BDA implementation. To show that, we have tackled the following research question:

- *How does the organizational culture affect the CSFs of BDA implementation?*

By elaborating from an empirical point of view above, we answer this research question in conclusion as follows:

Different types of organizational culture would leverage different CSFs. Clan culture characteristics tend to affect CSFs like communication, collaboration, trust, and information sharing. Adhocracy culture characteristics could affect CSFs such as free experimentation and change management. For market culture firms, CSFs like vision, skills, technology and leadership support would be influenced. Hierarchy culture tends to impact CSFs like the organizational structure and process. The results further implicate that CSFs should not be detached from the cultural context. By linking CSFs and organizational culture together, this thesis wants to provide a new perspective to evaluate CSFs of BDA. From this particular perspective, both researchers and practitioners could take the cultural fit into account while assessing the CSFs. In doing so, we believe organizations would see CSFs in a more holistic way and then will know how to implement BDA efficiently and effectively. Furthermore, this thesis also indicates that the implementation of BDA would have effects on organizational culture since other cultural characteristics could be introduced to improve the chance for BDA success. Thus, the organizational culture would evolve under the influence of implementing BDA.

6.1 Future work

Our thesis shows that organizational culture has impact on the CSFs of BDA. Additionally, we find that the relationship between organizational culture and CSFs is bidirectional. However, it has limitations as it is based on a limited number of interviews which impact its generalizability despite our efforts to increase transferability as described in the research quality section. We believe that it is important to perform quantitative research such as surveys to increase generalizability.

Another limitation arises from the difficulty to assess an accurate list of CSFs. As discussed in the theoretical background section, CSFs are sometimes better to be assigned on per company or implementation basis, so that our list of CSFs are generic and does not apply to all companies similarly. Future studies to investigate organizational culture or cultural mix that most likely to impact individual CSF positively or studies that investigate the best cultural fit to impact CSFs in specific organizational or industrial contexts are encouraged.

Appendix A: The OCAI test

1	Dominant characteristics	Now	Preferred
A	The organization is a very personal place. It is like an extended family. People seem to shar a lot of themselves.		
B	the organization is a very dynamic and entrepreneurial place. People are willing to stick their necks out and take risks.		
C	The organization is very results-oriented. A major concern is with getting the job done. People are very competitive and achievement-oriented.		
D	The organization is a very controlled and structured place. Formal procedures generally govern what people do		
	Total	100	100

2	Organizational leadership	Now	Preferred
A	The leadership in the organization is generally considered to exemplify mentoring, facilitating or nurturing.		
B	The leadership in the organization is generally considered to exemplify entrepreneurship, innovation or risk taking.		
C	The leadership in the organization is generally considered to exemplify a non-nonsense, aggressive results-oriented focus.		
D	The leadership in the organization is generally considered to exemplify coordinating, organizing, or smooth-running efficiency.		
	Total	100	100

3	Management of employees	Now	Preferred
A	The management style in the organization is characterized by teamwork, consensus and participation.		
B	The management style in the organization is characterized by individual risk taking, innovation, freedom, and uniqueness.		
C	The management style in the organization is characterized by hard-driving competitiveness, high demands and achievements.		
D	The management style in the organization is characterized by security of employees, conformity, predictability, and stability in relationships.		
	Total	100	100

4	Organizational glue	Now	Preferred
A	The glue that hold the organization together is loyalty and mutual trust. Commitment to the organization runs high.		
B	The glue that hold the organization together is commitment to innovation and development. There is an emphasis on being on the cutting edge.		
C	The glue that hold the organization together is the emphasis on achievement and goal accomplishment.		
D	The glue that hold the organization together is formal rules and policies. Maintaining a smooth-running organization is important.		
	Total	100	100

5	Strategic emphases	Now	Preferred
A	The organization emphasizes human development. High trust, opposes and participation persist.		
B	The organization emphasizes acquiring new resources and creating new challenges. Trying new things and prospecting for opportunities are valued.		
C	The organization emphasizes competitive actions and achievement. Hitting stretch target and winning in the market place are dominant.		
D	The organization emphasizes permanence and stability. Efficiency, control, and smooth operations are important.		
	Total	100	100

6	Criteria for success	Now	Preferred
A	The organization defines success on the basis of the development of human resources, teamwork, employee commitment, and concern for people.		
B	The organization defines success on the basis of having the most unique or newest products. It is a product leader and innovator.		
C	The organization defines success on the basis of winning in the market place and outpacing the competition. Competitive market leadership is key.		
D	The organization defines success on the basis of efficiency. Dependable delivery, smooth scheduling and low-cost production are critical.		
	Total	100	100

Appendix B: Interview Guide

We are students in Lund university attending Master of Information System and we are making a research about how organizational culture would affect the successful implementation of big data analytics (BDA).

Brief about us, our study and our research and notification that we will start recording the interview using mobile.

Before starting the questions, we are willing to make a cultural assessment to the company, it is based on 100 scores that must be distributed among the four possibilities of each question.

General information:

1. Would you please introduce yourself, the job in the company and your role in the BDA?
2. Would you please briefly introduce the situation of big data implementation in your company?

Critical success factors (CSFs) and Organizational Cultures

3. What are the main success factors of BDA in your company?
4. How would you describe your company's dominant characteristics?
5. How do you think that the dominant characteristics of your company culture influence the success of BDA?
6. What do you think could be the preferred characteristics of the company that impact the success of BDA? Why?
7. How would you describe your company's organizational leadership?
8. How do you think the leadership style in your company influence the success of BDA?
9. What do you think could be preferred organizational leadership that impact the success of BDA? Why?
10. How would you describe your company's management of employees?
11. How do you think that the management of employees in your company influences the success of BDA?
12. What do you think could be preferred employee management that impacts the success of BDA? Why?
13. How do you describe the glue (or bond) that holds the organization together?
14. How do you think that the type of glue that holds the organization together influence the success of BDA?
15. What do you think could be preferred organizational glue that impact the success of BDA? Why?
16. How do you describe the strategic emphasis for your company?
17. How do you think that your company strategically emphasize values that influence the success of BDA?
18. What do you think could be preferred characteristics that impact the success of BDA? Why?
19. How do you describe the criteria for the success of your company?
20. How do you think that the criteria of success in your company support the success of BDA implementation?

21. What do you think could be preferred success criteria that impact the success of BDA? why?

Appendix C: Interview with Respondent A

Date: 2019.05.07
Duration: 20' 41''
Interview Format: face to face
Transcription date: 2019.05.08
Interviewee: Junshi Chen
Company: TerraNet AB

I: interviewer
R: Respondent

No.	Speaker	Text	Guide Question
1	I	Now we are going to start the interview. Do you mind that we record the conversation?	
2	R	No.	
3	I	Thanks! So Would you please introduce yourself, your job in the company and your role in the implementation of BDA?	1
4	R	I am now in charge of a small project in our company. Our project is about the positioning based on the wireless signals of communication. It's for a positioning application on drone aircraft.	
5	I	Do you apply big data analytics in this project?	
6	R	Yes, we adopt big data analytics in our work.	
7	I	How do you use it?	

8	R	Let's take an example, the signal of our mobile phone. The signal of the wireless base station and the signal that sends to your mobile phone…by analyzing the strength of the signal that is sent to your mobile phone and the direction of the signal, we can locate the mobile phone…we will know where exactly your location is. That is, the location of this signal depends on the location of your mobile phone and location of the base station, as well as the surrounding environment. For example, if you drive a car on the street, and then you generate a lot of data…	
9	I	Like the location data?	
10	R	yes, exactly. If you analyze this large volume of data, then the next time when you go to a certain place, you can compare it based on the similarity between this location and the previous data, and then you can roughly or more accurately locate your current location. This is the application of big data.	
11	I	Then the second question is would you please briefly introduce the situation of big data analytics implementation in your company? Is it going well?	2
12	R	we are just starting to develop it…	
13	I	is it at an early stage?	
14	R	Yes, it is at an early stage. We just start it…	
15	I	What do you think are the main success factors of big data analytics in your company?	3

16	R	First, you need to collect a sufficient number of data. This is one point. The second one is the skills of your employees and how your employees apply big data analytics in those data. Then the third one is the support from the company's hardware and IT, which are still very important. Then the last one is you really need to think about the developing process and various developing tools that you have developed. The developing process of these and development tools are very important to the big data analytics. it is about how do you carry out your developing process	
17	I	Then from a management perspective, are there any key factors?	
18	R	That is to say, on the one hand, it may be the plan of your project. You need to have a project plan, a clear project plan, and then you need to know how to develop the project. Then you have to know how to formulate the plan, then the implementing of the plan and track your plan and get feedback from the plan. If something happens, you need to adjust the plan. This adjustment is also very important. You must have a clear goal and then you can adjust it in time when you meet some unexpected situations. If you have a project, you must first make a project plan, then you need to be clear about what step you are in, and then what kind of goal you want to achieve, and then in the middle of the process how do you track the progress of your project, well, also track the project.	
19	I	Yes, all right. Is there anything else to add?	
20	R	Well, the support from the leader of your company, like his attitude towards this project, and what kind of support he has. Another thing is, how do you cooperate with your business colleagues in the market	
21	I	Ok. So How do you describe your company's dominant characteristics?	4
22	R	Our company now are still…more like entrepreneurial culture, and market-oriented culture. So mainly features these two cultures. Entrepreneurship and market orientation.	

23	I	How do you think these two kinds of culture affect the implementation of big data analytics?	5
24	R	First of all, if it is an entrepreneurial company, or if it is a market-oriented company, it must pursue an innovation in technologies…	
25	I	For competitive advantages?	
26	R	Yes! If you need a technological innovation, then you have to be positive about the new technology from the management level or from top to bottom, and then the company has a positive attitude towards promoting the application of a new technology, such as big data, and he will…, that is to say, update the information and relevant knowledge timely, then to learn new knowledge and apply big data technologies. Thus, we can lead everyone in the company to learn new things together. Yes, because, after all, the requirements for new technologies are very high in the industries of IT enterprises. He needs to keep learning. You must ensure that you use some leading technologies in the industry before you can achieve better results.	
27	I	Then what kind of dominant characteristics do you prefer now?	6
28	R	I want more dynamic and innovative corporate culture.	
29	I	Then why do you want such characteristics?	

30	R	That is to say, if the company's attitude towards new technology is more positive, I think the employee's attitude towards the application of big data will be more positive. Moreover, from the perspective of the leadership, if you are in the management layer, you ask the employees of your company, or you say to your employees that they have to constantly update their knowledge structure, or they have to adopt the latest technology, they will learn more about BDA.	
31	I	OK, then the next question is about organizational leadership. How would you describe it?	7
32	R	Well I think the current leadership style is mainly innovation-oriented and risk-taking.	
33	I	How do you think it has influenced the implementation of Big Data Analytics?	8
34	R	Well, the leader will encourage you to adopt some newer… newer technologies in the industry. He will embrace some newer technologies and have a more positive attitude to use some technologies of big data.	
35	I	What kind of leadership do you prefer?	9
36	R	I am satisfied with what we have now	
37	I	OK. How do you describe the management of employees in your company?	10
38	R	I think it pays more attention to teamwork, consistency, and participation of employees.	

39	I	How do you think these influence the success of BDA?	11
40	R	In fact, I think most Swedish corporate cultures are like this. I think it is all like this. One is that he attaches great importance to the teamwork. The other is that you are always in the process of discussion, that is, if you want to achieve a goal, then you must reach a consensus among all the people. Then after you reach a consensus, you emphasize the participation of all relevant personnel. I think it is like this. It is a very traditional culture in Sweden, traditional for individuals. Its culture is more conducive to the cooperation between employees, yes, that is to say, if you have any problems, we will first solve all the problems in the early stage, then we could think about the problems clearly, and then to implement this thing.	
41	I	What kind of employee management do you preferred? Why	12
42	R	Maybe we still need something innovative, something free of experiment, which is relatively important. If it is innovative, then we could implement the technology more effectively.	
43	I	Do you mean you hope the attitudes towards new technologies to be more positive?	
44	R	Yes. Swedes are not like Americans who are pursuing independent and individual characteristics. In Sweden, there is a very famous law called Jante Law, that is, you should not think that you are different from others.	
45	I	Then the next one is about organization glue. We also call it cohesion. How do you describe it in your company?	13
46	R	In our company, I think we are connected together because of innovation, that is, everyone attempts to innovate and achieve the goal.	

47	I	How do you think this could affect the success of BDA?	14
48	R	That is to say, if you can have a product that can be sold on the market, such as the big data product, then there will be a great positive impact on the cohesion of all people or the morale. I mean it is like the positive incentives. So that is to say, if you have a goal, if you work together to achieve it, that is to say, we will have a shared goal, which could bind us together.	
49	I	you think it is very important to have a shared goal to achieve, and it is even more important than the innovation. Do you mean that?	15
50	R	Exactly!	
51	I	How do you describe the strategic emphasis in your company?	16
52	R	Goal achievements and innovation	
53	I	Ok. How do you think it would affect the success of BDA in your company?	17
54	R	from the perspective of strategy, everyone should keep an eye on the shared goal and achieve it by innovation. Technically, you need to emphasize your innovation.	
55	I	What is your preferred strategic emphasis?	18

56	R	High trust and participation. This is because in fact it is also a very significant feature of a Swedish enterprise culture.It emphasizes the personnel participation, and openness to others, mutual trust. these are basically the basic rules of a Swedish enterprise.	
57	I	Do you mean this could be easier for employees to accept the BDA?	
58	R	In fact, For Swedish enterprises, my understanding is that when they discussed a problem at earlier stage, they would open it up and discuss it fully. Then, based on this discussion, we will reach a consensus and then implement it. This way, we will reach a consensus first, then you will have sufficient discussion before reaching a consensus, and then we will follow this agreement after you reach a consensus. If there is no consensus, then the minority will be subordinate to the majority, also it may depend on your leadership anyway. In the end, It depends on the leaders.	
59	I	What is the success criteria in your company?	19
60	R	we are market success oriented. We need to sell our products.	
61	I	How do you think it affects the success of BDA?	20
62	R	If we want to achieve market success, that is to say, if you sell your product, your product must be a competitive product, so on the one hand, it means that your product is innovative, volume-supplied, practical and achievable. This is one reason why big data should be adopted in our project. I think big data analytics is a useful method. Then I still think big data analytics as an innovation, right. Innovation. This is good.	

63	I	What is your preferred success criteria for the implementation of BDA?	21
64	R	I think what we have now is good…it is OK…	
65	I	Thank you so much for your response. They are very helpful.	
66	R	You are welcome.	

Appendix D: Interview with Respondent B

Date: 2019.05.09
Duration: 32' 40''
Interview Format: Telephone
Transcription date: 2019.05.10
Interviewee: Anonymity
Company: Intel

I: Interviewer
R: respondent

No.	Speaker	Text	Guide question
1	I	Now we are going to start the interview. Do you mind that we record the conversation?	
2	R	No problem	
3	I	Thanks! OK, then we'll start our interview with the first question. Can you give us a brief idea of your position in your company? Including your role in the implementation of big data analysis technology?	1
4	R	My position in our company is silicon designer. My main job is designing circuit board and maintaining a database. As for my role in BDA…it is to judge which is better compared with the result of big data analysis. It's kind of like verification.	
5	I	What does that mean?	
6	R	I mean we do what we did before manually, but now we start using BDA to try to do what we did manually before.	
7	I	I see, you mean you use BDA to verify the result, right?	
8	R	yes, exactly!	
9	I	Then the second question is: Would you please briefly introduce the situation of big data implementation in your company?	2
10	R	For our team, it is at the earlier stage, we just start, and then our main task is to do silicon design. For our team, big data analytics is new technology. We don't fully use the results of BDA analysis, it is only used for verification.	

11	I	Yes, I understand. how you use BDA. Can you describe how you use this technology?	
12	R	Let's say if you want to design a circuit board, then on the circuit board, you need to specify its ... for example, where are the power lines, or where are the input ports and the output ports? Our job is to take advantage of every single square of your board, because the size of your board is limited, and then according to the position where you put these items, you should try your best to maximize the use of the whole board, if there is some space you don't put anything, it may be wasted. Too much spare space on the board will increase your cost, so when we have enough data from the past ... there are enough data, then we will collect them and use machine learning to analyze them to see how to optimize it, to get the best results. Because there are some…because there are enough data for our industry...	
13	I	Are you stressing enough data?	
14	R	Yes, unlike other manufacturing industries which have constantly updated data, such constantly updated data is not useful…we need enough data	
15	I	OK, I see. Then the following question is what do you think is the major success factor in your company, that is to say, what are the major success factors in implementing new big data technologies?	3
16	R	I think it depends mainly on the plan put forward by the leaders.	
17	I	Plan? Do you mean a clear goal, isn't it?	
18	R	Clear goals and clear processes. Goals are not enough, there must be processes. I think that the skills of personnel in a company like ours are not very important, I mean I think it is not a decisive factor compared with other factors, because everyone's backgrounds and professional skills are similar, and then it is important to make it clear when these jobs are assigned to the bottom. This is why I want to emphasize a clear process. In fact, When this job was assigned to the bottom employees, it was already very clear then you know what you are going to do. The process is very very important.	
19	I	OK, next question. How would you describe your company's dominant characteristics?	4
20	R	The dominant characteristics of our company are result-oriented.	

21	I	Do you mean in your company the main goal is to get the job done? Everyone is very competitive and achievement-oriented?	
22	R	yes!	
23	I	So how do you think this characteristic affects the success of BDA?	5
24	R	In such a result-oriented company, for a company like ours, if you got a task, you may need some data, those data usually offered by other groups. Or other groups wait for you to offer the data. That's why I stress getting your job done, because other group's next work is only possible to start when you finish your work and it must be done. You cannot let others wait for you. I would like to emphasize that everyone is very dependent on....because there are too many people involved in what you do, you must do your own work well so that others can take the next step. For a technology like BDA, you certainly cannot complete all the projects by yourself. I think for any larger enterprises, like Amazon and IBM, they all have a clear division of labor. For example, one group collects data and another group process the data. You have to finish your own work so that others can start their work.	
25	I	What do you think could be the preferred characteristics of the company that impact the success of BDA? Why?	6
26	R	I would like to emphasize innovation, because I think it is a new technology. For such new technology like BDA, you need to be innovative then you are willing to learn it. Besides, I think an innovative attitude is also dependent on the working environment. If your working environment supports the innovation, then the employee will be more eager to accept a new technology like BDA.	
27	I	How would you describe your company's organizational leadership?	7
28	R	coordinating and smooth-running	
29	I	How do you think the leadership style in your company influence the success of BDA?	8
30	R	As for reasons, you know, in our company, we will not say a task is totally up to you, or up to your personal ability. We rely on the whole organization, and most of our decision is made according to the rules in our organization, so chances are low for personal error. For example, our bottom level employee will be assigned smaller and clearer jobs, which will make it easier to finish the task.	

31	I	This is quite good. What do you think could be preferred organizational leadership that impact the success of BDA? Why?	9
32	R	innovation and market-oriented. It is because…it is a new technology, and it is still market-oriented. We want to enhance the market competitiveness of our product so we adopt BDA. Without market competitiveness, we will not innovate, and we do not need to adopt new technology ...	
33	I	How would you describe your company's management of employees?	10
34	R	employee management? ah, we pay attention to the cooperation and participation of team members, but we also attach great importance to freedom and the development of employees' personality, we also attach great importance to competition, but we also require the conformity of employees and the stability of the organization.	
35	I	Q: How do you think that the management of employees in your company influences the success of BDA?	11
36	R	I think no matter what you do, it's not just about BDA or other new technology. I think no matter what you do, the relationship between your employees is more important. because you work in a team. Innovation is also very important. Employees who are innovative are more likely to embrace the new technology. The other is freedom. It is a new technology, so we need freedom to… you know..trial and error. As for competitiveness, as I said before, we need to face the market. So we need our employees to be competitive so that they could adopt new technology. Finally, Only when employees obey rules in the company, can the task be executed from top to bottom ...	
37	I	I understand what you mean. You think all these factors are indispensable. Only when all these are satisfied can the employees develop new technologies to the maximum extent.	
38	R	yes!	
39	I	What do you think could be preferred employee management that impacts the success o BDA? Why?	12
40	R	No ha ha, the current situation is very good.	
41	I	How do you describe the glue (or bond) that holds the organization together?	13

42	R	We are linked together by the company's rules and regulations and also by innovative ideas.	
43	I	How do you think that the type of glue that holds the organization together influence the success of BDA?	14
44	R	In our industry, only when the new product is cutting-edge, then someone would buy you. the key point is whether your products can be sold or not. So cutting-edge is a very important factor for our industry, because it determines whether your company exists or not. For BDA, I think BDA is a relatively new technology, I mean, BDA is not fully used. Moreover, we are a very mature company. We have mature rules and regulations to us.	
45	I	What do you think could be preferred organizational glue that impact the success of BDA? Why?	15
46	R	I hope to have more mutual trust. In this way, there will be more information shared in our group and more cooperation. As I said, this is not something only one person can accomplish. It requires cooperation.	
47	I	How do you describe the strategic emphasis for your company?	16
48	R	Efficiency, control and smooth operation	
49	I	How do you think that your company strategically emphasize values that influence the success of BDA?	17
50	R	This is the same as what I said before. Only when the whole process is very clear, well-controlled and well-organized can you finish a task well. For example, we now have a very detailed schedule, then you can finish it one by one according to the schedule. The whole process is well-controlled	
51	I	What do you think could be preferred characteristics that impact the success of BDA? Why?	18
52	R	Openness and innovation. This is a new technology which need a new strategy, you cannot completely rely on the old strategy as before. You need innovation. So when supporting a new strategy, trust and openness are necessary.	
53	I	How do you describe the criteria for the success of your company?	19

54	R	At present, our company's success criteria is based on efficiency and then we focus on low-cost product.	
55	I	How do you think that the criteria of success in your company support the success of BDA implementation?	20
56	R	We predict that BDA technology will reduce costs and improve production efficiency, That's why we use BDA.	
57	I	What do you think could be preferred success criteria that impact the success of BDA? why?	21
58	R	it's still low-cost production. I think it is very very important. We use BDA to lower the cost. If BDA cannot do that, there is no need to adopt it.	
59	I	Thanks so much for your sharing.	
60	R	My pleasure	

Appendix E: Interview with Respondent C

Date: 10.05.2019
Duration: 33' 53"
Interview Format: Telephone
Transcription date: 11.05.2019
Interviewee: Shiyun Fan
Company: Yuanben Blcokchain, Shanghai

I: Interviewer
R: Respondent

No.	Speaker	Text	Guide Question
1	I	The first question is: Would you please introduce yourself, the job in the company and your role in the BDA?	1
2	R	I am a project manager of a blockchain projects. We have been applying big data analytics in our blockchain project. We combined big data technology with artificial intelligence	
3	I	Would you please briefly introduce the situation of big data implementation in your company?	2
4	R	Well, now we at the mature stage…For example, we could use BDA combined with blockchain technology to do public opinion analysis. BDA in our project ... Big data analytics provide us with a solid foundation. However, in our project, it actually relies more on artificial intelligence. Big Data analytics only provides us with analysis reports	
5	R	OK, let's move on to the next question. The next question is: What are the main success factors of BDA in your company?	3
6	R	First, our technical team has a strong R&D (research and development) ability. Secondly, our customer service is pretty good. Third, we have excellent business resources. The last one. I think we hand found a good approach to market. The market has great potentials.	
7	I	Well, the next question is, how would you describe your company's dominant characteristics?	4
8	R	The dominant characteristic of our company is we are like a family.	

9	I	How do you think that the dominant characteristics of your company culture influence the success of BDA?	5
10	R	I think it could stimulate the subjective initiative of employees so that It is easier to implement BDA from bottom to top.	
11	I	What do you think could be the preferred characteristics of the company that impact the success of BDA? Why?	6
12	R	I want our company to be market-oriented and more competitive, because what we should do is to face the market, we need to know what market wants, what the customers want, we adopt new technologies because we want to be competitive in the market.	
13	I	How would you describe your company's organizational leadership?	7
14	R	we focus on developing our employee's career management, help them to become a more professional blockchain practitioners	
15	I	do you mean nurturing your employees?	
16	R	yes!	
17	I	How do you think the leadership style in your company influence the success of BDA?	8
18	R	If you care about your employees, your employees will be more active. She will regard the company as a part of herself and will devote themselves more. Especially for new technologies like Big Data Analytics, we need employees to devote themselves.	
19	I	What do you think could be preferred organizational leadership that impact the success of BDA? Why?	9
20	R	Well I think I would emphasize on innovation and risk-taking because I think BDA itself is a very new technology, so you need to be innovative, nobody would tell you how to do it, you should have the spirit of entrepreneurship, because big data does not have a mature model at present. yes, that's right, now everyone is exploring in this field, so you should have the spirit of adventure.	
30	I	How would you describe your company's management of employees?	10
31	R	We are very open, we trust our employees, and I will say that reaching agreement is important for us.	

32	I	How do you think that the management of employees in your company influences the success of BDA?	11
33	R	It is because everyone would think that this is a decision we made to-gether… we…then we are more willing to do it…	
34	I	What do you think could be preferred employee management that im-pacts the success o BDA? Why?	12
35	R	Well I don't like the idea that we need to reach agreement for everything , because this may lead to low efficiency…low efficiency. I think it is necessary to have the sprit of adventure, we need a pioneer, we need our employees to be freer to trial and error.	
36	I	How do you describe the glue (or bond) that holds the organization to-gether?	13
37	R	A cutting edge product. You know what we do is blockchain, it is really competitive…we need to be the top 10 in this market	
38	I	How do you think that the type of glue that holds the organization to-gether influence the success of BDA?	14
39	R	because we all want to make the newest products, so we won't miss any new technologies, including big data analytics, including block-chains ...	
40	I	What do you think could be preferred organizational glue that impact the success o BDA? Why?	15
41	R	Well, I think what we have now is good.	
42	I	How do you describe the strategic emphasis for your company?	16
43	R	A high degree of trust, openness and participation. Our company is cur-rently in such a situation.	
44	I	How do you think that your company strategically emphasize values that influence the success of BDA?	17

45	R	The beneficial effect is that you have less burden in your heart, I mean you don't have to worry about things like your relationship with your colleagues, and then you can focus more on your work,.	
46	I	What do you think could be preferred characteristics that impact the success o BDA? Why?	18
47	R	Like I said before, the corporate culture of our company requires everyone's opinions to be respected. it will lead to many problems like unclear responsibility. Therefore, I expect more centralized management and a clear division of power and responsibility.	
48	I	I understand this, so you think it needs someone to take charge of this project, not everyone? Like a clear vision?	
49	R	Yes. Yes	
50	I	How do you describe the criteria for the success of your company?	19
51	R	I think our company's current success criteria pays more attention to employees' teamwork and innovation…and also a new product	
52	I	How do you think that the criteria of success in your company support the success of BDA implementation?	20
53	R	I think this problem can viewed in this way. Our company pays more attention to personal growth, personal development and team success. Therefore, from the perspective of the whole industry, we have trained a talent for the industry. Even if he leaves my company, he can still promote the development of the whole industry as long as he works in the big data industry.	
54	I	So your thinking scope is really broad, not limited to your company.	
55	R	yes, it is. Since we want to promote the development of the whole industry, not just our company. I think it is a common principle for any emerging technology. Because I think the market is no longer the same as the previous market, everyone is a zero-sum game, either you die or I live. Now It is a win-win game. Therefore, people are not paying close attention to what your competitors are doing, but whether you could solve the problems in the industry, promote the development of the industry and make progress.	
56	I	What do you think could be preferred success criteria that impact the success of BDA? why?	

57	R	A: In fact, I think it is the same reason and the same as what we've talked before. That is to say, for the industry and the enterprise, you need a more centralized management method, which will be beneficial. That is to say, it is still necessary to emphasize that there is a leader who have a clear vision to do this, and it cannot be said that everyone's opinions should be respected, which is really very inefficient. We need a strong leadership, the leader should have a clear vision, he should know how to do it, because BDA is a very new thing. In addition, a lot of data in big data industry are fake, and a lot of data are fake. My experience is now data source is not high quality, many data are false. And thus what you have analyzed is useless. The block chain can at least guarantee that your data is true. Our technology has already performed well in the industry and is ahead of the others.	21
58	I	Q: OK, thank you for sharing!	
59	R	A: you're welcome.	

Appendix F: Interview with Respondent D

Date: 11.05.2019
Duration: 20' 35''
Interview Format: Face to fact
Transcription date: 11.05.2019
Interviewee: Anonymity
Company: Anonymity

I: Interviewer
R: Respondent

No.	Speaker	Text	Guide question
1	I	Now we are going to start the interview. Do you mind that we record the conversation?	
2	R	No.	
3	I	Thanks! OK, then we'll start our interview with the first question. Would you please introduce yourself, the job in the company and your role in the BDA?	1
4	R	I am a data scientist now, and then we mainly use data, that is, big data from our selling market, and then extract some valuable information from the data.	
5	I	Would you please briefly introduce the situation of big data implementation in your company?	2
6	R	We've already had some products now. Our products rely on big data and…they are applied in supply chain management. I think our technology is mature now…	
7	I	Ok, so what are the main success factors of BDA in your company?	3
8	R	Well…there are many factors for success like…talents, skills, yes, the hardware is also needed.	
9	I	Then how would you describe your company's dominant characteristics?	4
10	R	Entrepreneurial culture and market-oriented culture.	

11	I	Ok, How do you think that the dominant characteristics of your company culture influence the success of BDA?	5
12	R	You know, BDA is a young technology. If you want to apply such a new technology, you must take risk because you need to invest. You need to invest time and money in learning, right? Being engaged in learning itself is a risk, that is, you have to explore how the new knowledge could add value. No one would tell you an answer, and you need to find the answer by yourself. Either you succeed or you fail. Chances are 50/50. As for the market-oriented…that is to say, after you've master BDA, you know how to conduct analysis, you need to think how do you transfer the knowledge to the products or practice it in reality, that is, how this knowledge will add value? This is a very important point for both our team and our big customers.	
13	I	Adding value is important. So What do you think could be the preferred characteristics of the company that impact the success of BDA? Why?	6
14	R	Still the two cultures I mentioned.	
15	I	How would you describe your company's organizational leadership?	7
16	R	emphasis on employees and coordination.	
17	I	I see. How do you think the leadership style in your company influence the success of BDA?	8
18	R	Such a leadership…I think it is because such a leadership attaches great importance to the training of employees. For training or mentoring, I think it is also very important. The talent is very important, very important, yes, besides, you should ask those talents to share their knowledge with other employees since we hope all employees would master the new technology. I also emphasize the organizational structure because in a large company, or in a large organization ... for example, you are in an organization, you have your own skills, he has his strengths, and then how do you better coordinate everyone's strengths to a target? This requires a leader to coordinate so that all employees can work together to achieve our business goal.	
19	I	What do you think could be preferred organizational leadership that impact the success of BDA? Why?	9
20	R	I want more freedom because we are doing something new, and we don't want to be confined by KPI. Besides. we need the freedom to think in the long run, I mean our goal cannot be limited to this year or next year. We need to have a long-term goal, like a five-year plan.	

21	I	Yeah, I agree. How would you describe your company's management of employees?	10
22	R	We emphasize teamwork. That is, everyone should reach an agreement, and everyone should participate in the game.	
23	I	How do you think that the management of employees in your company influences the success of BDA?	11
24	R	In such a culture, every employee will learn in the process of participating. Everyone is mastering new knowledge, and learning from each other…. In fact, in our team, everyone is…his role is different. For example, I have the background of statistics, he has the background of mathematical models, and others have the background of programming. These are all indispensable knowledge of big data technology. Only when everyone works together can we master the analysis technology of big data.	
25	I	That's a good point. Everyone contributes to the team. What do you think could be preferred employee management that impacts the success of BDA? Why?	12
26	R	I prefer more innovation and freedom. As for reasons, just like what I've mentioned earlier, because the new technology itself is a kind of…, because it is something you need to pioneer, you need to explore, that is, you may succeed or fail, so you need to have an open mind and give the employees enough freedom to explore.	
27	I	Ok. Let's move on to the next question. How do you describe the glue (or bond) that holds the organization together?	13
28	R	First, we encourage mutual trust. Also, we encourage innovation, to learn cutting-edge knowledge, and then achievement is very important.	
29	I	How do you think that the type of glue that holds the organization together influence the success of BDA?	14
30	R	First of all, I think this environment of mutual trust is necessary for everyone ... OK, so everyone can work together. For example, you give me the data you have collected, and I believe you, then I could proceed with the data, and then we can finish the project together. Yes, Next one is innovation. I have always advocated that we should innovate in our company. Because the world is changing every day, we should try to shape the future. To shape the future, we must innovate and develop a new idea.	
31	I	What do you think could be preferred organizational glue that impact the success of BDA? Why?	15

32	R	Well, I don't want to change.	
33	I	How do you describe the strategic emphasis for your company?	16
34	R	Openness	
35	I	How do you think that your company strategically emphasize values that influence the success of BDA?	17
36	R	It is very important that you are open-minded since you are learning a new technology.	
37	I	What do you think could be preferred characteristics that impact the success of BDA? Why?	18
38	R	Trying new things and finding new opportunities. It is because data science develops very fast. It is because there are many people and many companies who are doing it now. Therefore, data science is changing every day. Therefore, it is more important for us to innovate and develop new things … We should enrich ourselves with new ideas, new knowledge to achieve competitiveness.	
39	I	I see. How do you describe the criteria for the success of your company?	19
40	R	Cost control.	
41	I	How do you think that the criteria of success in your company support the success of BDA implementation?	20
42	R	We want to reduce costs. This is a must. For a company, the cost is very important.	
43	I	What do you think could be preferred success criteria that impact the success of BDA? why?	21
44	R	I think we want to win the marketplace. Because we not only want to pursue low costs, we also want high profits. New technologies will bring you high profits. That's why we invest in new technology.We will get higher profits and we will earn more money. That is why we will adopt new technologies.	
45	I	Ok, I finished the interview. Thanks!	

46	R	You are welcome.	

Appendix G: Interview with Respondent E

Date: 12.05.2019
Duration: 27' 11''
Interview Format: Telephone
Transcription date: 12.05.2019
Interviewee: Yvonne Wu
Company: AdBridge, Hangzhou

I: Interviewer
R: Respondent

No.	Speaker	Text	Guide Question
1	I	Now we are going to start the interview. Do you mind that we record the conversation?	
2	R	No.	
3	I	Thanks! Then let's begin. My first question is: Would you please introduce yourself, the job in the company and your role in the BDA?	1
4	R	Well, I am the project manager in our company, my job responsibility is related to advertisement promotion. That is a bit like what Google AdSense do. However, we mainly rely on 360 big data analytics, not Google analytics. Then advertising promotion can be divided into three categories. The first one is active search, and the second one is information flow, which is more closely related to BDA. Information flow is closely related to BDA, we may use BDA to find the pattern of people's search behavior, browsing behavior, and then we do advertising promoting according to the patterns we find. That's how we use BDA and that's also what I am working on.	
5	I	Ok, Would you please briefly introduce the situation of big data implementation in your company?	2
6	R	Well, in our company…Our BDA team was set up in August last year, and then at present…we had the exploratory stage, but now we are in a high-speed growth stage. However, we are not in a mature stage.	
7	I	What are the main success factors of BDA in your company?	3
8	R	Emmm, I think it's the desire for innovation, and good training, and…support from the leaders. Oh and most importantly, we know	

		what we are going to do by adopting BDA.	
9	I	Do you mean a clear goal?	
10	R	Yes	
11	I	Good. Then the next question is How would you describe your company's dominant characteristics?	4
12	R	I think we are very active, well-motivated and we emphasize the entrepreneurial spirit, our employees are willing to take the risk. Another point is the competitiveness is really fierce in our company. You have to be very competitive.	
13	I	How do you think that the dominant characteristics of your company culture influence the success of BDA?	5
14	R	If we want to adopt a new technology like BDA in a company, you need to be aware that not every one are willing to learn new things, to make changes. So if you want to make BDA a success, you need your employees to be very well-motivated. For example, we are required to work overtime since we need to win the marketplace, you know, the competition is very fierce in this field. But if you don't work overtime, if you don't seize opportunities, it could very hard for us to survive in the market. Everyone is doing BDA now, what is your advantage? You need be ahead of them. Second, in our company, I would say your salary is decided by your achievement, your salary is directly related to how many customers you sell our products to, so as long as you sell this product, your salary will be increased. BDA would make our products more popular since everybody is using it. That's why we use BDA.	
15	I	Well, What do you think could be the preferred characteristics of the company that impact the success of BDA? Why?	6
16	R	Well, I want more…I hope it could be more like a family.	
17	I	Why?	
18	R	Well, now each department just focus on its own business and we don't cooperate well with each other. However, if the relationship between each department could be improved or even becomes more harmonious, our efficiency will be greatly improved. Then…for example, the relationship between our finance department and our business department is not very good. Just what I mentioned before, we need to work overtime on weekends, and then we may have a customer who has no balance in his account and needs a top-up, and then the finance department doesn't want to support us. Then the customer will be very unhappy…it will negatively affect our selling of	

		our products, so I think it is necessary to strengthen cooperation between departments.	
19	I	How would you describe your company's organizational leadership?	7
20	R	Leadership? Our leaders are just like a wolf.	
21	I	A wolf? What does it mean?	
22	R	You know, pioneering, risk-taking. Entrepreneurship is our corporate culture.	
23	I	How do you think the leadership style in your company influence the success of BDA?	8
24	R	Our company will give you more freedom to innovate. That is, we don't confine you. We offer you the stage to let you "dance" freely. You can adopt new technologies like BDA, and you don't have to be afraid that you may fail. And then you learn how to use BDA, and gradually you become an expert in this field. That's how we encourage our employees to learn BDA.	
25	I	Sounds good. What do you think could be preferred organizational leadership that impact the success of BDA? Why?	9
26	R	Well…what I prefer is…efficiency.	
27	I	Do you mean smooth-running efficiency?	
28	R	I think so. I have to admit that our efficiency in developing BDA is low. You know it has just been mentioned that our overtime-working culture is very popular since Jack Ma from Alibaba praises and advocates overtime-working culture. I would like to say that the bosses of any company want to make money. Your boss would be happy if you could work very very very hard since the more time you work, the more profit you earn. However, the efficiency of overtime-working culture could be very low. For example, now we usually spend 10 hours everyday in developing BDA in our company, and we also work in the weekends. And all our team members are very tired. However, if our company focuses more on how to work effectively within less time like 8 hours, it could be much better. I mean we would be more efficient in developing BDA in our company.	
29	I	Ok. So how would you describe your company's management of employees?	10

30	R	As for employee management, well… I would like to choose key-words like risk-taking, innovation, and freedom	
31	I	How do you think that the management of employees in your company influences the success of BDA?	11
32	R	Without such management, no one would like to adopt BDA. Do you know the failure rate is high for adopting BDA? However, in our company, we encourage our employees to explore new technologies freely, we encourage them to find how to generate value from big data. Why? Since this is our corporate culture. We try to create such an atmosphere for our members, we tell them just go to explore the unknown area.	
33	I	So that they can embrace new technologies more actively, right?	
34	R	Yes	
35	I	Good. What do you think could be preferred employee management that impacts the success of BDA? Why?	12
36	R	Well, I hope we can focus more on the security of employments, the stability…because…you know in our company… the competition is very fierce. If you could not keep up with our pace, then…you fail. Many people left our company because they can't adjust themselves to such culture. Do you know how we attract our employees? We talk about our great vision with our potential employees. But for employees, compared to the great vision…they prefer stability and high salary. They earn money to support their family. In our BDA team, our team members are very hard working. But we cannot always talk about vision, innovation… what they need is money…is a stable working environment. High pressure would freak them out, and then some of them will choose to leave. Then who would develop BDA? We don't have talents.	
37	I	Yes, Okay, then How do you describe the glue (or bond) that holds the organization together? I remember you just mentioned a great vision.	13
38	R	Yeah! We…we are connected by our vision: we want great achievement.	
39	I	How do you think that the type of glue that holds the organization together influence the success of BDA?	14
40	R	At present, we have 41 competitors in the markets. But we are the leading one. Or we are the best in this field. In order to keep being the leading role in the market, we adopt the BDA to be more competitive, to win the market.	

41	I	What do you think could be preferred organizational glue that impact the success of BDA? Why?	15
42	R	Well, we don't need too much change.	
43	I	Ok, How do you describe the strategic emphasis for your company?	16
44	R	Find new opportunities, win the competition, pursue efficiency.	
45	I	How do you think that your company strategically emphasize values that influence the success of BDA?	17
46	R	Do you know Wolf Culture in business?	
47	I	Yes. This means that your company still emphasizes a kind of *Fighting* spirit, right?	
48	R	Exactly! If our company wants to maintain a leading position in a market, then we must learn new technologies and then create new values, that's how we become the leading company.	
49	I	Then, what do you think could be preferred characteristics that impact the success of BDA? Why?	18
50	R	I want to focus more on training.	
51	I	Why?	
52	R	You know, we are not doing well in training mid-level or senior managers. Some of them even lack a basic knowledge about BDA. We need support from them, so we must let them know how important BDA is.	
53	I	This view is really unique and the previous people did not mention that. Yes, it is really unique. How do you describe the criteria for the success of your company?	19
54	R	well, the success criteria, selling more products, attracting more customers, and earn more money.	
55	I	How do you think that the criteria of success in your company support the success of BDA implementation?	20

56	R	Our company will pay more attention to the cost. Because cost has a direct relationship with profits, That is to say, the ultimate goal of any new technologies is to make profits or to reduce costs.	
57	I	Ok. What do you think could be preferred success criteria that impact the success of BDA? why?	21
58	R	Well. More care for employees. I think more attention to employees will help to develop any new technologies like BDA. It is your team members who learn how to use BDA. It is your employees who apply BDA to earn profits. Although we focus on Wolf Culture, we should care about our employees. You need to treat them like a family then they would like to share your vision.	
59	I	Anything else?	
60	R	No	
61	I	Thanks so much!	
62	R	No worries!	

Appendix H: OCAI Excel sheet

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