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Contextual critical success factors for the implementation of business intelligence & analytics: A qualitative case study

Philippus Vosloo
University of Pretoria, danie.vosloo@gmail.com

Rennie Naidoo
University of Pretoria, rennie.naidoo@up.ac.za

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Philippus Vosloo
University of Pretoria
danie.vosloo@gmail.com

Rennie Naidoo
University of Pretoria
rennie.naidoo@up.ac.za

Abstract

Business intelligence & analytical (BI&A) implementation success depends on the interplay between CSFs-in-context. One persistent criticism of work in IS implementation has been the neglect of exploring implementation CSFs within a multi-layered context. Findings from a case study at a large banking organization in South Africa suggest that an adequate analysis of business intelligence and analytics implementation involves interweaving a CSF analysis with the distinctive features of its multi-layered context. This includes the bank's intraorganizational context and the IS and BI setting (inner-context) and the broader socio-economic and political context (outer-context) as domains of analysis. The evidence shows that the actions and interactions of organizational members involved in the BI implementation were being shaped and constrained by the dynamics within these contexts – in particular, coping with complex contextual challenges exerted increasing demands on the implementation team. The ability of the implementation team to overcome these situational demands was at best mixed and the success of the BI implementation therefore varied from unit to unit within the bank. Practitioners should sharpen their problem-solving skills by assessing CSFs within the unique situations they encounter. Future case study research should provide an explicit description and analysis of CSFs-in-context to deepen our understanding of effective BI&A implementations.

Keywords: Business intelligence, banking, case study, context, critical success factors, IS implementation, South Africa

1. Introduction

Implementing business intelligence and analytics (BI&A) technologies successfully is among the most complex problems facing organizations today. In an ecosystem of connective social media, such as Facebook, YouTube, Twitter and many other platforms that are embedded into the daily lives of individuals, the ability of organizations to import Big Data from various sources in many different formats, and to gain useful insights that support effective decision-making calls for increasingly significant investments in BI&A technologies (Van Dijck, 2013). In a world of Cloud Computing and the Internet of Things (IoT) where networks of physical objects embedded with electronics, software, and sensors that are enabling interconnected linkages of supply chains, markets and businesses (Sahay & Ranjan, 2008) and thus the collection and mounting exchange of Big Data from terabytes to exabytes, significant investments in BI technologies has arguably become even more crucial, to make sense of an increasingly ubiquitous, data-rich environment (Chen, Chen, Lim, Chen, & Chen, 2013; Chiang, Goes, & Stohr, 2012).

This increasing web of connectivity has created both theoretical and practical challenges for Information Systems (IS) implementation. From a practical standpoint, the successful

implementation of BI&A technologies is expected to provide timely insights and support decision-making that leads to productivity benefits for organisations and society at large. However, BI&A implementations are failing to meet these expectations (Hawking, 2012; Richards, Yeoh, Chong, & Popovič, 2017; Ul-ain, Giovanni, & Delone, 2019). According to a forecast by Gartner (2019), BI&A spending is expected to exceed $23.3 billion this year and reach $27.6 billion by the end of 2022. This means that the BI market is expected to grow by almost 6% annually for the next three years. However despite the market success for vendors, the failure rate of BI implementations in organizations is unusually high at 70% to 80% (Gartner, 2011). Similarly, the current success rate of big data projects is only around 15% (Gartner, 2017). Howson (2014) notes that BI adoption among employees is low at only around 22%. Despite the enormous risks involved in investing in BI&A technologies and the low levels of benefits realised (Yeoh & Popovič, 2016), many CIOs continue to view investments in BI&A technologies as a top priority for their organizations (Kappelman et al., 2017).

BI systems differ from other information systems by the way in which its back-end components integrate with the data sources of other systems, the manner in which it facilitates the aggregation of the data collected, and the way in which it manages unstructured and structured data (UL-ain, Giovanni, & Delone, 2019). On the front-end, users experience increased processing capabilities when analysing huge amounts of data, and work with various front-end applications, such as, analysis solutions, ad hoc query, reporting and forecasting (Chaudhuri, Dayal, & Narasayya, 2011; Khan & Quadri, 2012; Negash, 2004). BI can be defined simply as a technology platform for supporting decision-making in the organization (Sahay & Ranjan, 2008). Negash's (2004) more elaborate definition states that "BI systems combine data gathering, data storage, and knowledge management with analytical tools to present complex internal and competitive information to planners and decision makers." This definition suggests that the success or failure of BI implementations may not necessarily lie with the BI technology or even with the BI project itself, but may be influenced by the surrounding organizational environment (Olbrich, Pöppelbuss, & Niehaves, 2011, 2012; William Yeoh & Popovič, 2016). From a theoretical standpoint, this necessitates a broader conceptualisation of IS implementation for BI&A technologies.

Given the high failure rates of BI implementation and low user adoption rates, much research has also been devoted to searching for generic factors of BI implementation success (Dawson & Van Belle, 2013; Yeoh, 2010; Ziemba & Olszak, 2012). However, IS implementation theories have noted differences in external contextual factors among different industries and technologies (Dwivedi et al., 2014). Furthermore, these theories acknowledge variation of implementation success factors along the stages of implementation (Côrte-Real, Ruivo, & Oliveira, 2014). Indeed implementation scholars have suggested that when studying internal social contexts of varied actions and interpretations, it is an unsound practice to group together organisations with radically different social histories and organisational settings (Dwivedi et al., 2014).

The objective of this research is to provide a better contextual understanding of the CSFs for BI&A implementations. It is based on an analysis of an ongoing BI&A implementation in a large banking organization based in South Africa. The key contribution of this paper is the proposal of contextual critical success factors (CCSF) for the implementation of business intelligence & analytics, which improves upon extant understanding of BI implementation CSFs, beyond a generic understanding. In addition, this paper addresses two weaknesses in the extant BI&A implementation CSF literature. First, CSFs that are sensitive to the

organizational context have been under-researched and second, there have been calls for BI&A implementation CSF studies to move beyond a generic level of analysis to reflect on the intricacies of local and broader contextual processes at work (Davison & Martinsons, 2016). This study also has important practical applications as it is currently difficult for managers and practitioners to implement BI&A technologies successfully in the absence of guidelines on how to manage CCSF to mitigate the risk of implementation failure.

2. Business Intelligence Contextual Critical Success Factors

A number of factors that may affect the successful implementation of BI&A systems have been identified in the IS and related literatures. Among the more important factors are top management support and involvement, clear mission for BI in the organisation, alignment to critical business processes, and change management. In the context of BI implementation, additional issues include the need for data / information quality, data reliability, BI&A expertise, analytical skills, technical skills, high quality source systems and integration, and BI&A development standards (Cosic, Shanks, & Maynard, 2015; Jamaludin, 2011; Larson & Chang, 2016; Yeoh, 2010). However, research on information systems and BI&A systems in particular has been critiqued for producing endless lists of factors which are inconclusive, inconsistent and characterised by low levels of explanation (Olbrich et al., 2011; Yeoh & Popovič, 2016). The Wixom & Watson Model for Data Warehousing Success provides a basis for creating a structure to organise the different aspects or components that influence BI success (Wixom & Watson, 2016). According to this model, the ultimate success of a data warehouse implementation is dependent on success in three key areas: (1) success with organisational factors, (2) success with project factors, and (3) success with technical factors (Wixom & Watson, 2001).

However, the influence of factors can be shown to be dependent on the time, place, history, situation and context in which they are applied (Bijker & Hart, 2013; Olbrich et al., 2012). Institutional arrangements, context and technologic and economic constraints can reshape the implementation space. Though this is acknowledged by some implementation theorists, the extent to which factors affect different stages in the implementation process differently is still limited. Factor-based research is consistently being undermined by the complexity in the BI&A social context. The notion that stakeholders involved in BI&A systems implementations should consider multiple contextual factors of a socio-technical nature is not new (Olbrich et al., 2011, 2012). Olbrich, Pöppelbuss, & Niehaves (2011) first coined the term Critical Contextual Success Factors (CCSFs). They define CCSF as “those factors that lie outside the actual BI system implementation and maintenance project but still influence BI system success, positively or negatively.” While traditional CSF studies emphasised relevance, Olbrich, Pöppelbuss, & Niehaves (2011) also emphasise the controllability of a factor as being crucial in the decision as to whether to allocate time and resources to manage a CSF.

However, this view of CSF still has a strong bias towards managerial issues and effective management practices (Bullen & Rockart, 1981; Rockart, 1979) and underplays the complex historical, socio-economic, cultural and political processes in an organisation (Bussen & Myers, 1997; Markus, 1983). This paper proposes a more holistic definition of BI&A implementation. BI&A implementation should be viewed as a collection of social, organisational and technical resources that are employed in the transformation of organizational decision-making processes. It also expands on their definition of CCSF to include meso-industry, macro-national and micro-organisational level contextual factors that

influence BI&A implementations. We used the results of this review and the Wixom & Watson Model (Wixom & Watson, 2016) to formulate a set of sensitising concepts as an initial framework to facilitate a discussion with BI&A stakeholders about their perceptions about the contextual CSFs for BI&A implementations.

3. Research Method

The main research strategy selected for this research is an in-depth case study of a single organisation (Walsham, 1995). Given the interpretive stance adopted in this research and the nature of the research problem, the case study approach is an appropriate research strategy for this topic. The same research questions could have been approached using surveys designed to examine the effects of the BI&A implementation in the organisation and among the various BI&A stakeholder communities. However, this might not reveal in detail the unique experiences of the individual organisation and the layers of factors influencing the change. The case study strategy was chosen because of its advantages in creating novel and profound insights and its focus on examining the effects of rich social-technical influences on the implementation of BI&A initiatives in the context of a banking organisation. The chosen approach also maintains a balance between the wider context of BI&A and the issues of BI&A implementation and change at the local organisational level (Klein & Myers, 1999). Therefore the case study approach is especially useful in novel situations like BI&A implementations, where contextual conditions of the events being studied are critical (Davison & Martinsons, 2016).

4. The Case of National Bank

The first BI system at National Bank (pseudonym) was implemented for the Bank Supervision Division (BSD) in the early 1990s. The bank implemented a decision support system (DSS) software called System W which was one of the first OLAP tools to cater for financial applications by using a multidimensional cube approach. Like most organizations at the time, the MIS systems department provided the Bank with standard reporting requests. BI then spread to the National Bank's Insurance Risk Management Division (IRMD), Financial Sector Stability and Risk Monitoring Division (FRD), Financial Surveillance Division (FSD), Economic and Statistical Research Division (ESRD), National Cash Management Division (NCMD), National Payments System Division (NPSD), and supporting units, such as the Human Resources Division (HRD). Cubes built were mainly available in monthly and quarterly time periods and cover subjects, such as risk management, risk monitoring, foreign exchange movement, macro and micro economic and statistical research, national cash management information, and national payment systems data. Today National Bank has around 550 BI users. These users are supported by the BI Centre of Excellence (BI COE). The BI COE has a staff compliment of about 25 people. The team is made up of a BI manager, BI Design Head, Solution Designers, Data Quality Specialists, Data Warehouse Specialists, a BI Development Head (Delivery), Developers, Testers, a BI Maintenance and Support Head, Support Developers, Application Support Staff, and lastly a BI Database Administrator (DBA). It is important to note that only 12 staff in the BI COE are permanent while the rest are contractors. The systems architecture is relatively complex and uses technologies from 4 major software vendors. For example, the environment includes Oracle Data Integrator (ODI), Essbase (OLAP), Microsoft PowerBI, and SAS for advanced analytics purposes. The reported case concerns a specific BI project for the Financial Markets Division (FMD). The main objectives of the project were to adopt BI reporting and analytics to improve decision-making in the domestic and foreign treasury market environments, to implement data management

principles, to automate the sourcing of data, to address data accuracy, timeliness of data, completeness, and accessibility issues, and to ensure that all reports, analytics and data sharing are based on a single data repository. The case study began during the early implementation stages at FMD which began in July 2018 and ended in November 2018. It was an opportune moment as our study coincided with a period when the bank was reviewing its overall BI strategy and capability that involved many of the BI stakeholders. The review focused on the organization's readiness for big data implementation, developing a business case for AI and Machine Learning, and simplifying the overall BI environment. The review also focused on the strategic and tactical CSFs for the bank's BI&A implementation. Strategic CSFs refer to factors that are crucial for the bank to achieve its mission. For example, providing inaccurate information can have catastrophic consequences, such as instability and uncertainty in financial markets and harming poor and vulnerable consumers. Tactical CSFs refer to factors that are crucial for the bank's BI&A project implementation. The implementation team were considering both strategic and tactical project CSFs to improve their likelihood of succeeding. National Bank's success with BI&A implementations has been mixed over the years. Implementation at some divisions were very successful e.g. for BSD, because the implementation team engaged better with the user subculture within this division, and their BI&A solution was refined over time.

5. Research Design

The researchers used purposive sampling to choose an information-intensive organization with a mature BI programme that was established more than 25 years ago. Data was collected using both primary and secondary sources. The primary data sources included 18 face-to-face formal interviews. Informants included 1 BI End-user, 3 BI Analyst Developers, 3 BI Development Leads, 1 Business Analyst, 2 Enterprise Information Specialists, 1 Data Analyst, 2 BI Architects, 2 Senior IT Managers, 2 Executives, and 1 BI Project Manager. 16 participants had over 16 years of experience in BI while only two participants reported less than 10 years of experience. Interviews were semi-structured, including some closed questions and some open to ensure adequate probing. An interview guide was used to ask informants about how they perceived BI&A implementation at the bank, what the CSFs are, if and why they have succeeded, and so forth. One researcher conducted all the interviews, but both researchers were involved in interpreting the various accounts. Interviews lasted between 45 and 60 minutes, and the average duration was approximately 50 minutes. All interviews were taped and transcribed. Interviewees were selected in order to provide a broad representation of the stakeholder groups involved. This was supplemented by secondary data in the form of internal documents, which included the Project Management Process, Programme Management Plan, and the IT Strategy Review, and so forth. The data were analysed using ATLAS.ti content analysis software. The constant comparison analysis method was used (Strauss and Corbin, 1998). In the first analytical step, line-by-line coding, was performed to identify emergent codes, such as "management buy-in". In the second iteration of coding, prior CSF dimensions and categories were used as sensitizing devices and were assessed within the inner and outer context on the bank.

6. Empirical Interpretations of Contextual Critical Success Factors

In the empirical study, we enquired about a range of different potential CCSFs behind BI&A implementation success. These CCSFs appeared to belong to three core dimensions: *organizational, project and technical*.

6.1 Organisational success factors

Five categories were identified in the organizational dimension, namely: *executive management support, collaboration between business and technical teams, alignment of BI investments to critical business processes, end-user involvement, and change management*.

6.1.1 Executive management support

Executive management support was identified as one of the most critical factors influential to BI success by the majority of the participants. It is vital for executive management to understand the need for BI in the organisation, and BI should be driven from the top-down, and not the other way round. Executive management is responsible for the allocation of budgets for hardware, software and human resources, so it is vital for them to be supporting and driving the BI initiative throughout the organisation. Participant 3 amplified the importance of executive management support when he stated: *"There is no point in starting a BI project if you don't have executive management buy-in in terms of why it is important for the organisation, department or division or whoever in business that needs business intelligence…business intelligence is primarily for the business world so there has to be executive management support, otherwise you will struggle with issues like sponsorship, with budget, with approval in terms of what you have done. You might have missed the target in terms of what business is looking for, so without that you are most likely to fail."* This finding is in line with Wixom & Watson (2001) who state that one of the most common reasons for data warehouse failures is weak management support. It was also found that it is imperative that the executive management of the organisation supports the sponsor of the BI project. Participant 1 highlighted this relationship when she noted: *"The executive management is obviously supporting the sponsor, because if the executive management does not understand why your organisation needs BI, they are not going to sponsor the sponsor."* Wixom & Watson (2010) agrees that strong, committed sponsorship is one of the readiness factors for BI. Executive management support is considered to be a vital aspect of any project conducted within National Bank and this was confirmed through the documentation analysis.

6.1.2 Collaboration between business and technical teams

A large number of participants considered collaboration between business and technical teams as one of the critical factors that determines BI success. In support of this, Hawking & Sellitto (2010) found that it is important to utilise both technical and business personnel on BI implementations. The significance of collaboration between business and technical teams is pointed out by participant 16 who states: *"I'm a strong proponent of integrated business and IT teams because that's where I've always seen the greatest results…from my experience in the industry is that where you've got close collaboration between business and IT teams as one team you get better results out of it."* Close collaboration is required between all department areas and business and technical teams, including senior management, end-users, consultants and vendors (Woodside, 2011). The importance of continuous collaboration is illustrated by the statement made by participant 11: *"It's an ongoing process, even after the BI has been implemented, there's always going to be enhancements or new things that the business might want to have, and if they don't collaborate they might come with a user requirement that is archaic."* Participant 9 stated: *"…the collaboration between IT and business is key to breaking down the us-versus- them culture."*

6.1.3 Alignment of BI investments to critical business processes

The majority of participants regarded the alignment of BI investments to critical business processes to be one of the critical factors influential to BI success. A common reason for the failure of BI initiatives is misalignment between the BI strategy and the business vision, resulting in the BI system not meeting the core business objectives and not satisfying the business' needs or the end-users (Olbrich et al., 2012; William; Yeoh, 2010). The BI system

will thus not be accepted and there will be no buy-in from business. Participant 18 emphasised this point by stating that: *"Why would we have wanted to implement BI into an organization if it doesn't fit with your business critical processes? Then you might as well leave it. You're not going to have the buy-in from business. It's going to mean nothing."* Participant 10 detailed how the alignment of BI investments to critical business processes creates business value: *"The business strategy whereby critical processes are running also needs to talk to the implementation of BI. Because ultimately this business processes generates data…data that needs to be put in a data store. And that's where you build your BI which report on the data where it's coming from these business processes. And based on that, that's when you can create value for the organization…if for an example you want to pre-empt what's going to happen in the future - that directly impacts how you do things now, and this data can assist you to make those decisions and prepare for what's coming."*

6.1.4 End-user involvement

A large proportion of the participants found end-user involvement to be critical in achieving BI success. Participant 3 stressed the importance of end-user involvement when he stated: *"Often what happens is that people who are physically going to be using the system are the last to be consulted. They are the ones who will have to use it day-in and day-out, so they have to be considered when the solution is built, because they are going to be using it day-in and day-out."* This finding is supported by the research of Wixom & Watson (2016) who state that inadequate user involvement is one of the most common reasons for data warehouse failures. The DW Success Model proposes that user participation is one of the implementation factors that influence both organisational implementation and project implementation success. In addition, end-user involvement improves the access that the project team has to experts from the business. When the project team does not have immediate access to experts from the business it could cause delays and negatively impact project timelines. Participant 6 stressed the importance of having immediate access to experts from the business when he stated: *"If you need their expertise you can get them at short notice. It is not something where you can only have access to this person in a month's time, because that would obviously be detrimental to the project."*

6.1.5 Change management

The finding indicates that change management plays an important role before, during, and after implementation of a BI project. Participant 3 stated: *"Change management has to be involved right at the beginning to produce awareness within the scope of what you're doing…get people over the resistance to change, anger, frustration and acceptance. They help smooth out that process."*

6.2 Project factors

Two categories were identified in this theme namely *having a business champion* and *resources that are committed full-time to the project*. These categories are discussed in detail below.

6.2.1 Having a business champion

The identification and appointment of a business champion was found to be another factor that is crucial to achieving BI success. The participants argued that executive management support on its own is not enough since executive managers are somewhat removed from the operational level, and this is where the business champion plays a key role in bridging the gap between executive management and the operational staff. The business champion must be able to communicate up the hierarchy, down the hierarchy, and horizontally as well. Participant 14 refers to the role that the business champion has to play in the change management process*: "…it's really hard to convince people of the value of letting go of what they have been doing all this time, and that's what they've come to trust. Now you give them something new. Again, that's*

why you need one business champion…" Participant 4 stated: *"If you do not have a strong business understanding and a strong drive for wanting to understand your data and use BI, you're never going to implement it. So if you do not have a business champion that is driving it and understands what they are trying to get to, the output, you are not going to be successful."* The criticality of the business champion is supported by Yeoh & Koronios (2010) as they argued that having a business champion that has appropriate business insight is critical because such a person will be able to foresee organisational challenges and call for required adjustments to the system when required. The business champion also has to ensure that there is collaboration between business units as well as between the business and the project team (Aruldoss, Travis, & Prasanna Venkatesan, 2014; Taskov, 2009; Yeoh & Popovič, 2016). The champion has to possess the influence to be able to overcome any resistance that may emerge within the organisation, as well as provide political support to the BI project team (Wixom & Watson, 2001).

6.2.2 Full-time commitment of resources to the project

Many participants responded that having resources that are committed full-time to the project is another crucial element in achieving BI success. BI is a very resource-intensive initiative and National Bank struggles to implement a build and a run team in the IT department due to resource constraints. This leads to resources often having to work on more than one project simultaneously, or perform both project work and daily maintenance and support tasks in parallel. The result of not having enough dedicated resources is that productivity on the project is lower, which can lead to project milestones not being met, as well as an increase in the risk of changes happening in the business environment when the project takes too long to be completed. Participant 2 supported this notion and stated: "*BI is a big project, especially in an organisation as big as National Bank. You may not have all resources fully committed but the majority of them need to be fully committed to make sure that the project is a success, because if you take too long things may actually change while you are still trying to implement a solution, and by the time you finish implementing a solution it is no longer relevant so you need resources to be committed to deliver in time."* Participant 18 recognised that in National Bank it is not always possible or practical to have all the resources committed full-time to the BI project, but it is imperative that a core team is committed full-time to the project. She stressed the importance of this by saying: *"…it is not always possible to have all the people all the time on a project, but you need to have a certain percentage of your crucial people committed full-time to your project, else they just get torn in different directions and you're not successful."* According to Woodside (2011), problems with resources regularly have a negative impact on implementation success. The complexity of new technologies and the existence of a knowledge gap often require the recruitment of consultants. BI projects have the requirement of dedicated consultants to improve productivity on the project and keep up with project timelines, as well as improving the knowledge transfer of new technologies. The use of consultants should be a temporary solution only, because knowledge-loss happens when consultants leave.

6.3 Technical factors

Three categories were identified in this theme namely *data / information quality and reliability*, *BI expertise – technical skills*, and *flexibility of the BI solution* in adjusting to new information sources and incorporating new decision support tools. These categories are discussed below.

6.3.1 Data / information quality and reliability

Many participants agreed that data / information quality and reliability is the most critical success factor in the technical dimension. Participant 9 stated: *"…data / information quality and*

reliability…is the most important part in the execution phase, which talks to value realization because the data and the information and the reliability that the solution produces has got a potential of sinking, or really creating value for the organization." Data / information quality and reliability has a direct influence on decision-making as well as user acceptance of the BI system. Wrong decisions could have far-reaching effects for National Bank as it could lead to wrong investment decisions (money can be lost) and reputational damage due to providing incorrect data to the South African financial market. Participant 2 stated: *"Without reliability and quality you will not have a BI solution at all because it won't be used or accepted. User acceptance won't happen. The reports won't be used and people will just go back to the way they used to do things because they cannot trust your solution."* This was explained by participant 10 who said: *"…the first thing that you have to do is to assess the quality of the data, because if the data doesn't have the quality, you are not going to realize the benefits…Firstly the reporting that management decisions will be based on will be incorrect, so decisions that are based on incorrect data - there is no way they will result in good business value realized from it."*

6.3.2 BI expertise – technical skills

A large number of participants found BI expertise – technical skills to be a critical factor contributing to BI success. It was found that these technical skills are especially important in the build and deployment phase of the BI project, since it is the phase where database design and modelling, extract transform and load (ETL) routines, and other technical tasks are performed, and the BI solution is built (Jamaludin, 2011; Trieu, 2017). There are multiple technologies and tools that can be used, but you need the right expertise to be able to select the technologies and tools that are fit-for-purpose. Resources with a high level of experience will be better equipped to ensure that maximum use is gained from the technologies and the maximum benefit is realised. In the context of National Bank, it was found that a combination of BI expertise in technical and analytical abilities is required, and success is more likely if the organisation possesses both skill sets. Participant 9 made this comment on the skills required: *"…I think the two skill sets complement each other very nicely. I think in any situation where you lack some of those skills, analytical or technical skills, you will have challenges delivering on your BI project and the expectations of the end-users."*

6.3.3 Flexibility of the BI solution

Flexibility of the BI solution in adjusting to new information sources and incorporating new decision support tools was also found to be a critical factor in achieving BI success. Participant 2 mentioned: *"…nothing stays stagnant, things change, requirements change, ways of doing business change, and hence there would be a need for new information, new ETL, new connection to a new source, and new reports. So the system should be designed in a way that it accommodates changes."*

While the findings above support the broad applicability of general CSFs to the bank's settings (Wixom & Watson, 2016), Table 1 shows that it is important to both identify the CSF, as well as to identify and delineate in detail specific features of context – i.e. perform a contextual assessment. To show the value of CSFs-in-context, the authors examined the contextual patterns of a generic CSF (e.g. flexibility) and, through discussion, established a contextual assessment of flexibility. This contextual understanding of flexibility provides the implementation team with a better ability to design a BI&A system, component, or process within the constraints imposed by the bank's inner and outer contexts.

Critical success factor	Contextual Pattern	Example	Evidence from Interview
Flexibility	**Contextual Assessment of Flexibility** • Outer context influencing inner context • Inter-organizational links • Changing external market environment	*New type of trade/financial instrument or new type of entry* Due to changing market conditions the traders in the trading room can trade a new financial instrument which has a direct effect on the BI reporting. The new instrument can potentially have totally different cash flow entries, settlement entries, accounting entries, etc than other instruments and could require different rules when ETL operations are performed. BI reporting has to change due to new or different groupings of data because of new financial instruments in the system.	Respondent 1: "My experience is while you are programming the business has already changed. I have an example of when I had to create a BI solution and I just finished the technical specification and along come a new type of trade, a new type of entry never used before. I had to change my BI solution there and then. That is how flexible it must be."

Table 1: Varying contextual patterns of flexibility in a BI&A implementation

7. Discussion

While the sensitising concepts from prior CSF research by Wixom & Watson (2016) was useful in pointing out CSF dimensions irrespective of context, our qualitative analysis was particularly useful in shedding light on the nuances of context and its influence in shaping these CSF dimensions. The CSFs-in-context approach complements the traditional CSF approach in making sense of tactical options and choosing the most appropriate interventions to plan, resource, execute and achieve greater success with BI&A implementations. In particular, a contextual assessment can guide the team to recognize and diagnose the multi-layered contextual and interrelated CSFs impacting the implementation. The CSFs-in-context approach can also provide the team with the ability to anticipate and respond mindfully and quickly to contextual shifts. The case study's in-depth analysis of the outer and inner context will resonate with practitioners. Most BI&A implementation studies, even case studies, tend to neglect these contextual challenges and overemphasise the CSF dimensions without understanding its relevance in certain contexts. The case study calls for adopting a holistic and pluralistic approach that considers CSFs and context jointly. It is hoped that this expanded framework offers new insights to help organizations achieve better success with BI&A implementations. The present study has a few limitations worth noting. First, our review to develop our sensitising CSF dimensions and categories was limited to the relevant literature on CSF for BI. It is possible that general IS implementation articles would have made an additional contribution. Second, insufficient time was spent with end-users, despite the executives, business analysts and application consultants acting as appropriate surrogates for the users. Directly interacting with more users could have possibly led to added insights about the BI&A implementation challenge at the Bank. Future research will address these limitations.

8. Conclusion

Understanding the contextual nature and applicability of CSFs is crucial to the successful implementation of BI&A technologies. This study examined the organization, technical, and project CSFs impacting BI&A systems implementation in a large banking organization. It appears that traditional CSFs, while still relevant, can provide a deeper understanding of CSFs in BI&A system implementations, by accounting for contextual dynamics. The findings from an in-depth interpretive case study concluded that the CSFs-in-context can enrich our understanding about the constraints and impacts of socio-economic, historic, cultural, political, and other contexts on BI&A systems implementations. This enlarged conceptualization of CSFs-in-context suggests that BI&A systems implementations cannot be isolated from the context in which it occurs, and only by closer analysis can one discover which factors are influential in a particular context, and why they are in fact influential. Moreover, the case study revealed the significance of the contextual assessment of CSFs as a tool for advancing the assessment of interventions and tactics to help organizations achieve better success with BI&A implementations. To advance our knowledge about effective BI&A implementations, future case study research should consider how different contexts can shape and influence an emerging BI&A solution.

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