

CHAPTER 6: CONCLUSION

Overview of how research questions are answered, summary of contribution, recommendations for future research and an overall conclusion

1. Introduction

This chapter presents the conclusion to the thesis. It starts by examining key findings in terms of the secondary research questions that were asked at the outset of the research. The chapter then describes the key contributions that the thesis makes, building on the key contributions already identified in Chapter 1 in respect of existing research. Suggestions are then made for future research. Finally, this is followed by an overall conclusion, summarising the key finding of the thesis with reference to the core research question.

2. Key findings

Key findings are discussed within the structure of the research questions. Reference is made to the chapters in this thesis where questions are answered. The core research question is discussed last.

2.1 Core challenges experienced in BI

What are the core challenges currently experienced in BI?

The core challenges currently experienced in BI were investigated in the literature study in Chapter 3 Part 1 and again in the case study in Chapter 4 Part 2. Although the case study highlighted 24 detailed-level challenges in addition to the 25 detailed-level challenges that emerged in the literature study, it also supported the challenges identified in the literature study – presenting a strong correlation between the literature and case study findings on challenges.

The same main categories of challenges were identified in both the literature and case study, answering this research question on the core challenges currently experienced in BI. Core challenges currently experienced in BI are: using BI optimally; managing “big data”; integrating BI across many complex technology, data and business layers; aligning and balancing the needs of the various role players in BI; recruiting, retaining and using BI personnel and their skills effectively; getting the right sponsor in place; realising and measuring ROI; and operating in an ambiguous environment. The literature study’s detailed challenges supporting this list were coded as: U1-U10; D1-D3; etc. The case study’s detailed challenges supporting this list followed the same coding, except were prefixed with “CS” to denote “Case Study”, e.g. CSU1, CSD1, etc.

Both the literature and case study also identified generic IS and IS project implementation chal-

lenges. After it was confirmed that these categories were identified in both literature and case study, they were excluded from the scope of the thesis – the focus of this thesis is BI's challenges rather than generic IS challenges. Core challenges and challenge categories were summarised to a more conceptual level for purposes of comparison with BI's dominant worldview in Chapter 4 Part 3 and with G-D Logic characteristics in Chapter 5.

2.2 Attempts made to address core challenges

What attempts have already been made to address BI's core challenges?

As with the question above, this research question is answered in the literature study in Chapter 3 Part 1 and again in the case study in Chapter 4 Part 2.

The literature study describes examples of attempts to address BI's core challenges as: Critical Success Factors (CSFs); Actor Network Theory (ANT); Multi-faceted solutions using CSFs; Critical Contextual Success Factors (CCSFs); BI maturity models (BI MMs); BI frameworks; and Business Intelligence Competence Centres (BICCs). It identifies that current attempts to overcome BI challenges are not entirely successful by highlighting restrictions or limitations of each attempt.

The case study identifies that current attempts seen in practice focus mainly on project and implementation activities involving implementing BI technology solutions. As with the literature study, case study participants identify measures such as BI best practices, BI frameworks and strategies, readiness and maturity assessments, etc. A key finding is that the BI customer and the BI provider are separated in their views of how to overcome BI's core challenges, both suggesting measures that fit within aspects of BI that they see only themselves to be involved in or to have control over. Another key finding is that attempts to address BI's core challenges that emerge through the case study – like those identified in the literature study – generally have limited success.

2.3 Characteristics of BI's worldview

What worldview characteristics emerge in terms of BI through perceptions, past and predicted behaviour, values, actions and source of knowledge of academics and practitioners studying and working in the field of BI?

BI's worldview is identified in the literature study in Chapter 3 Part 2 and in the case study in Chapter 4 Part 3. As with the questions above, the literature and case study both reveal insights in terms of BI's worldview characteristics that complement and support each other.

Worldview characteristics are described within the framework of the elements of a worldview based on the work from Apostel and van der Veken (1991); Funk (2001); Heylighen (2000); and

Vidal (2008:4-6). Elements consist of: ontology; explanation; prediction; axiology; praxeology; and epistemology. A summary of BI's worldview, referencing the literature and/or the case study as the source of each worldview characteristic, is reflected in Table 16 in Chapter 4 Part 3. It is not repeated here as a result of the length of this table.

A key finding is that BI is typically perceived in one or a combination of ways, namely, as a: technology; process; product; or capability.

2.4 Differences in worldview characteristics between BI customer and BI provider

Are there differences in the worldview characteristics (including perceptions) that are held by BI customers versus BI providers?

Answers to this research question stem from Table 16 in Chapter 4 Part 3, where the literature study findings on BI's worldview characteristics (found in Chapter 3 Part 2) are consolidated and compared with those of the case study.

Some differences emerge in how BI providers and BI customers see and understand BI. BI providers' dominant perception is that BI is a technology or a process, with BI providers defining BI as a technology more than BI customers do. BI customers' dominant perception is that BI is a process. A key finding is that both BI customers and BI providers understand BI in terms of the organisation's processes and rules (syntactically) rather than in terms of the organisation's environment and context (semantically).

Another key finding is that BI providers (both BI vendors and BI departments) typically have IT, Engineering and Science backgrounds while BI customers (excluding the BI departments as customers of BI vendors) typically have Business, Finance and Accounting background. It is established that these diverse BI customer and BI provider backgrounds create a gap between BI customer and BI provider in terms of their competencies. In addition, BI customer and BI provider are observed to focus restrictively on their lack of knowledge of each other's expertise rather than on sharing their expertise.

These differences appear to affect the BI customer's participation in the BI process, as BI customers typically only participate in BI solution development when required to by a BI provider. They also appear to affect the BI provider's levels of frustration with the BI customer, resulting from the BI provider's perception that BI customers "meddle" and the BI provider's desire to spend more time on BI discovery activities.

2.5 A typical or dominant worldview for BI

Do the worldview characteristics identified for BI constitute a typical or dominant

worldview that is currently held of BI by these academics and practitioners?

A dominant worldview is compiled in Chapter 4 Part 3 based on literature and case study findings. Each worldview element that emerges in the literature and case study is discussed and a summarised table is presented where worldview characteristics are listed per worldview element. Worldview characteristics are flagged to indicate whether the finding occurs in the literature or case study, or both the literature and case study. While some findings emerge in the case study alone and others in the literature study alone, literature and case study findings are largely congruent and do not contradict each other. A common or dominant worldview held by BI academics and practitioners can therefore be seen to emerge.

Further to this, although there are certain differences between insights to BI's worldview from BI provider and BI customer case study participants – as discussed in 2.5 above – it can also be observed that as these views do not contradict each other, they also contribute towards a common or dominant worldview for BI.

2.6 BI's dominant worldview grounded in G-D Logic

Can a pattern be detected in BI's worldview characteristics, revealing that BI's worldview is grounded in G-D Logic?

Chapter 5 addresses this research question by analysing BI's dominant worldview through S-D and G-D Logic lenses. This analysis reveals that G-D Logic is inherent in each of BI's worldview elements, confirming that there is a pattern whereby it can be seen that BI's dominant worldview is grounded in G-D Logic. G-D Logic characteristics are indicated in a summary view of BI's dominant worldview, where the G-D Logic characteristics that emerge in BI's worldview are grouped into five main categories. These are: value-in-exchange (A); compete through goods and their features (B); separation of BI customer and BI provider (C); focus on means, production and producer (D) and; services in the context of G-D Logic (E).

Each of these categories is discussed in terms of the BI worldview element wherein the G-D Logic emerges. Reference is made to G-D and S-D Logic literature, which is applied to the dominant BI worldview that was compiled in Chapter 4 Part 3 based on the literature and case study.

2.7 The relationship between BI's dominant worldview, its challenges and G-D Logic

Is there a relationship between BI's dominant worldview, its prevailing challenges and a grounding in G-D Logic?

This research question is addressed in two chapters – Chapter 4 Part 3 and Chapter 5. Both chapters confirm that there is such a relationship.

Chapter 4 Part 3 establishes that there is a relationship between BI's worldview and BI's prevailing challenges. BI challenges are tabulated (at a conceptual level, per worldview perception (technology, process, etc.)) and are linked to BI worldview characteristics (using the coded references for this, e.g. 1, 2, 3, etc.) as well as the detailed-level of BI's prevailing challenges (using these coded references, e.g. U1, D1, CSA6, etc.). As each challenge and worldview characteristic can be directly or indirectly linked in this way, this establishes that BI's dominant worldview contributes towards the occurrence of its prevailing challenges.

Chapter 5 then establishes that there are inherent G-D Logic characteristics in each of BI's worldview elements, from which it logically follows that this inherent G-D Logic contributes to the prevalence of BI's challenges. Chapter 5 then takes this reasoning further as it also examines BI's prevalent challenges using G-D and S-D Logic lenses. It does this once again at the conceptual level of the challenge, per BI worldview perception – as done in Chapter 4 Part 3. This analysis reveals that there are common G-D Logic characteristics in BI's dominant worldview and BI's prevailing challenges.

Chapter 4 Part 3 and Chapter 5 reflect this relationship at the level of BI worldview element and conceptual challenge and link to the detailed levels through the coded references to worldview characteristics and detailed level challenges. Appendix H reflects this at detailed levels of BI worldview characteristic and detailed level challenge.

2.8 New avenues to overcome BI's prevailing challenges

By shifting the worldview that currently dominates BI from a conceptual grounding in G-D Logic to a conceptual grounding in S-D Logic, are new avenues to overcome BI's prevailing challenges opened for those who practice or study BI?

This is the core research question of this thesis. The answer to this question builds up through a number of chapters across the thesis. For instance, the worldview that currently dominates BI is identified in the literature study in Chapter 3 Part 2 and in the case study in Chapter 4 Part 3. Furthermore, the inherent grounding that this worldview has in G-D Logic is identified and described in Chapter 5. This core research question is, however, specifically addressed in Chapter 5 where new avenues to overcome BI's prevailing challenges are proposed in the form of the description of the conceptual shift from G-D to S-D Logic for BI. This is then substantiated with suggestions of a conceptual approach as well as a pragmatic approach to apply S-D Logic to BI.

The core research question is discussed again in the overall conclusion (Section 5 below).

3. Contribution

Although the contribution has already been discussed in Chapter 1, it is necessary to revisit the contributions and key insights to conclude this research.

3.1 Contributions identified in Chapter 1

Chapter 1 identifies key contributions that this thesis makes to existing research. These include: contributions towards understanding BI's specific challenges as well as understanding BI at a broader and more conceptual level; identification of a dominating BI worldview as a unique approach (to the knowledge of the researcher) to examine BI, providing novel insight to the discipline of BI and; analysis of the dominant BI worldview through G-D and S-D Logic lenses.

Contributions towards understanding BI's specific challenges are provided in the literature and case study on BI challenges in Chapters Three Part 1 and Four Part 2. The contributions towards understanding BI at a broader and more conceptual level as well as identification of a dominating BI worldview are provided through analysis of how BI is perceived, contextualised and what worldview characteristics emerge through the views and voices of academics and practitioners (including BI customers and BI providers). This is provided in the chapters on BI's worldview in Chapter 3 Part 2 and Chapter 4 Part 3. Finally, analysis of BI's dominant worldview through G-D and S-D Logic lenses is provided in Chapter 5, a theoretical foundation of G-D and S-D Logic is provided in Chapter 3 Part 3. A novel approach is used for the latter, namely, explanation of G-D and S-D Logic using the elements and framework of a worldview.

3.2 Additional contributions and key insights

In addition to these contributions, this thesis offers a few specific insights as contributions towards BI practice and theory. Firstly, the thesis draws attention to the fact that many of the BI challenges consistently raised in literature and practice (through the literature and case study) are in fact generic IS – or even IT – challenges. In doing so, it unearths the insight that BI is frequently understood narrowly (and restrictively) as an IS or an IT within an IS. This insight aligns with another key insight, namely that BI academics and BI practitioners tend to see BI in terms of four typical perceptions – technology, process, product or capability – and from the perspective of the organisation (syntactically) rather than in the context of the organisation's environment (semantically).

Secondly, by analysing BI's challenges, this thesis contributes a consolidated list of BI's challenges, an overview of current measures taken to address BI challenges and a comparison of BI challenges with BI CSFs (where CSFs represent one of these measures). While the list of BI challenges does not purport to be an exhaustive list, it provides a current view of challenges that BI and related disciplines face according to literature and practice. In terms of this, a key insight is that – at a conceptual level – BI and related disciplines, methodologies and solutions are primarily aimed at addressing the same long-standing managerial issues but do not consistently do so, resulting in challenges. Various tools, methodologies and even disciplines have emerged over the years which can be seen, at a conceptual level, to be aimed at these long-standing managerial issues, e.g. DSS, EIS, MIS, BI, analytics, etc. Examples of the long-standing managerial issues

are: decision-making and analysis of the organisation to improve performance, save costs, compete, increase profits and predict trends. Organisations report that they are data rich but information poor, that they lack actionable information needed for decision-making and that they experience many challenges in this regard.

A third contribution emerges through analysis of BI's dominant worldview and challenges through G-D and S-D Logic lenses in Chapter 5. This contribution provides the insight that there is a relationship between BI's dominant worldview, its prevalent challenges and G-D Logic. More specifically, it provides the insight that there is an inherent G-D Logic in BI's dominant worldview which contributes to the prevalence of its challenges.

A fourth contribution in this regard is the thesis' recommendation of a conceptual approach to shift BI's dominant worldview from G-D to S-D Logic. The conceptual approach includes both a theoretical foundation (the BI value coin and the ten BI FPs) and a pragmatic set of guiding principles. Both the anticipated benefits and the potential implications of shifting BI's dominant worldview from G-D to S-D Logic are also discussed in this thesis as a contribution to literature and practice. The aim of this is that the recommended conceptual approach is applied and tested with these benefits and implications in mind. This provides scope for future research, discussed next.

3.3 Key academic contributions

This thesis is grounded within the domain of IS research and is conducted according to accepted IS research practices and methodologies. It is therefore necessary to clarify the key academic contributions that this thesis makes. Key academic contributions are identified as twofold, where both key academic contributions are seen to assist in developing a better understanding of the theory that underpins the BI domain.

Firstly, this thesis provides a novel perspective from which to view BI. As this is currently unavailable in the literature, it provides a new opportunity for BI discourse to move conceptually into this socio-technical domain. Secondly, from another angle, it extends S-D Logic discourse to the domain of BI, highlighting conceptual approaches to as well as implications of applying S-D Logic within this domain.

4. Future research

The following opportunities for future research are identified in this thesis:

- This thesis provides a conceptual analysis of BI through G-D and S-D Logic lenses as a foundational step to apply S-D Logic to BI. It is therefore recommended that future research uses this foundation to analyse BI in the context of G-D and S-D Logic at more detailed levels. Suggestions in this regard are:

- Focus on individual S-D Logic FPs or groupings thereof in terms of how they can specifically be applied to BI, as recommended by Vargo (2012a). One suggestion is to focus on the co-creation of intelligence or insight as an operant resource within a complex value network to improve competitive advantage (FP 4). A second suggestion is to focus on involvement of the BI customer to co-create value (FP 6 and 10).
- Investigate using the intelligence or insight that is co-created in the BI service flow to provide service to the customer of the organisation. For example, by mining customer data to better understand customer context and environment through data on customer interactions (amongst other things) with the aim of achieving effectiveness and sustainability rather than simply efficiency gains, as suggested by Vijayaraghavan et al. (2011:302-304).
- Investigate whether any S-D Logic characteristics emerge in a dominant BI worldview in other environments or under other conditions than reflected in this thesis. If these do emerge, an interesting enquiry would be to investigate how to enhance S-D Logic characteristics in such an environment. It could also be interesting to analyse the resulting benefits or whether G-D and S-D Logic characteristics – assuming both emerge – can co-exist within a BI environment or organisation without resulting in the creation of separate factions or other tensions.
- An enquiry is suggested to investigate and compare what may be considered predecessor or related concepts or paradigm shifts such as customer-orientation, user-centric design or even service-oriented design and Software as a Service (SaaS) in context of the approach suggested in this thesis and in the context of S-D Logic. This may even be extended beyond BI and IS to the organisation, for example, consider paradigm shifts such as: from in-house specialisation of a function to outsourced services; or from mass production to mass customisation. Such an enquiry could provide a focused view of a specific paradigm shift in terms of what has already been performed, what is already un/successful and how lessons from this history can be brought forward (potentially from the IS or BI domain) into S-D Logic or the BI worldview proposed herein.
- This thesis identifies that the BI service flow spans the organisation and even extends beyond the organisation to suppliers, the organisation's customers, etc. An enquiry is suggested to determine whether the BI service flow can benefit from an S-D Logic approach if S-D Logic is applied only within a team, a department, the organisation or whether it must be applied across the full BI service flow to be effective. Another avenue of investigation may potentially be the supply chain, which may be seen to represent a series of business processes and organisational competences on which BI/data may be gathered and used (Luhn, 1958:315). Lusch (2011:15) suggests that IT is perhaps the meta-force altering business, society and the practice of Supply Chain Management (SCM). This can potentially be extended from IT to BI, specifically because of this relationship between BI, business processes/competences and the supply chain.
- Validation or testing of the conceptual approaches recommended in Chapter 5 to shift BI's dominant worldview from G-D to S-D Logic is not within the scope of this thesis. A suggestion

is therefore to test these. This could potentially be done in a case study in an environment where G-D Logic is identified as a significant influence, or in a comparative case study of a large and a small organisation. Such tests have the potential to confirm whether the benefits of making the paradigm shifts from G-D to S-D Logic outweigh the effort and cost thereof and may identify different opportunities or challenges subject to the size of the organisation.

- Further research into improving the ability to measure BI's ROI is recommended using the approach highlighted by S-D Logic and described in the guiding principles in Chapter 5. I.e. where BI customers link BI investments to their processes and BI providers link BI value propositions to the organisation's core competences.
- Research is suggested on the application of Service Science – including Service Systems Theory, S-D Logic and even the practical developments of Service Science – to BI. A suggestion is to examine the BI service flow as a Service System.
- Aspects of S-D Logic that could potentially be better understood by applying S-D Logic to BI present further research opportunities. For example, parallel processes whereby co-creation processes take place to turn an operand into an operant resource from an S-D Logic viewpoint alongside BI processes turning data into information, knowledge, intelligence, insight, etc.

5. Overall conclusion

This thesis started by asking the core research question:

By shifting the worldview that currently dominates BI from a conceptual grounding in G-D Logic to a conceptual grounding in S-D Logic, are new avenues to overcome BI's prevailing challenges opened for those who practice or study BI?

It is now possible – based on the analysis and findings reflected in the preceding chapters – to conclude that new avenues to overcome BI's prevailing challenges are presented by shifting BI's dominant worldview from its conceptual grounding in G-D Logic to a conceptual grounding in S-D Logic. Preceding chapters reveal the G-D Logic inherent in BI's dominant worldview and how this contributes towards the occurrence of BI's prevailing challenges. As a result, key shifts are recommended for BI to shift from this G-D Logic to an S-D Logic. Advantages that this can potentially result in are identified along with analysis of how BI's prevailing challenges may be overcome through such a shift.

A recommendation is therefore made that the five key shifts from G-D to S-D Logic that are proposed for BI in Chapter 5 are made using the conceptual approach suggested. As identified in Chapter 5, this has the potential to assist those practicing and studying BI to overcome BI's prevailing challenges.