Understanding Business Intelligence Understanding: Through Goods- and Service-Dominant Logic Lenses

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Abstract: Business Intelligence (BI) project failure rates are high and expected benefits are not always achieved when implementing a BI solution in an organization. Failure is characterized by recurring challenges that remain largely unresolved. Could a better understanding of BI and its challenges emerge by taking a step back to examine how BI is understood? To answer this overarching research question, this paper presents a philosophical perspective to understand BI understanding as a means to understand the understanding from where BI challenges stem and, ultimately, overcome challenges to realize expected benefits more consistently. BI understanding its model of reality or worldview is examined using a worldview framework, derived from a literature study. Worldview characteristics are identified through a study of how BI is explained in the literature and perceived by those who practise BI as a profession. Goods and Service Dominant Logic are then used as philosophical lenses through which to examine both the worldview characteristics of BI and the challenges experienced when implementing a BI solution. This answers further research questions. First: what are the characteristics of the model of reality or worldview of BI as a discipline? Second: is it plausible that the model of reality held about BI by BI practitioners and academics influences and even represses the realization of benefit? Research is supported through a literature study and an interpretive case study. This paper's main contribution is the exploration of new avenues to overcome recurring challenges through a unique analysis of BI understanding through G D and S D Logic lenses using the framework of a worldview.

Keywords: Business intelligence; worldview; goods-dominant logic; service-dominant logic; service science

1. Introduction

Business Intelligence (BI) is identified as the most essential technology for the organization to purchase [8]. However, organizations struggle to realize significant business value from their BI investments: over 50% of BI projects fail [32]. Existing solutions to address BI failure and challenges are largely ineffective [9], highlighting the need for a new approach.

This paper responds with a new approach, in two specific ways. The model of reality that exists of BI is examined by answering key questions to build an understanding of how BI is perceived and understood – identifying a dominant worldview of BI held by BI practitioners and academics. In other words: understanding the understanding of BI. Then through an interdisciplinary approach whereby concepts from the Service Science Management and Engineering (SSME) (also referred to as Service Science) discipline are applied as a fresh new lens through which to examine the identified BI worldview. This provides a new approach to better understand BI that can, ultimately lead to increased BI project success allowing organizations to realize more significant business value from their BI investments than is currently consistently the case. This paper highlights the potential of this new approach as a means to overcome specific BI challenges that emerge in the study.

Service-ecosystems theory (the theoretical foundation for Service Science) is complemented with Service-Dominant (S-D) Logic (the philosophical foundation for Service Science) [56] by examining BI as a service-ecosystem through Goods-Dominant (G-D) Logic and S-D Logic lenses. The point of departure for this paper is that, firstly, a theoretical base for core Service Science concepts is established within the discipline of SSME. Secondly, that the SSME discipline is positioned towards expansion through contributions from interdisciplinary fields such as BI, Management Information Systems (MIS), Knowledge Management, etc. [63]. This makes it unnecessary to redefine service concepts in this paper, aside from where these concepts are briefly defined where clarity is needed in terms of BI.

BI – a specialized type of Information System (IS) [5] – is positioned conceptually as a service-ecosystem. BI is examined at an abstract level, as the broad series of exchange activities performed with the ultimate purpose of providing actionable information and/or intelligence for use in decision-making [27]. BI is contextualized in terms of exchange as it is identified that there are various exchange activities performed throughout the BI process, i.e. processes to transform raw data into useful information for insights and decision-making [12]. Understanding BI as an exchange process offers opportunities to understand the various socio-technical relationships (e.g. between BI customer, BI provider, systems, processes, information), interactions, handovers, checkpoints and the end-to-end flow that takes place from when data is sourced until it is used (in another form, e.g. intelligence).

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This paper presents context and findings from the literature, supported with results from an interpretive IS case study of the BI exchange process. A recommendation then follows, consolidating key findings and revisiting research questions.

2. Literature

2.1 Using a Worldview Framework to Understand Views of Reality

A worldview is a view of reality that affects behavior [26]. It can be held by an individual or collectively by a group. Scott M. Peck, author and psychologist, contextualizes the concept of an individual's worldview eloquently by explaining that it is a view of reality that is built up and expanded, gradually over an individual's lifetime that is like a map with which to negotiate the terrain of life [43]. In the same way, there are worldviews of business, economy, IT, ISs – and even BI.

A "cognitive map" of what constitutes BI, how it works, what it aims to achieve, etc. has been formed by participants in and observers of BI over time. Like the map or worldview of the individual, BI's worldview is constantly revised, redefined and shaped by its environment. It also constantly shapes values and behavior or actions of those who operate within the BI environment [18]. Not only do the actors involved in BI exchange have perceptions of BI but they also engage in actions that shape their interactions and relationships and the various BI exchange processes that they are involved in [11]. By analyzing these perceptions and actions, typical characteristics and common assumptions that are shared amongst many of BI's actors are identified. These are seen to guide the understanding of the nature of BI, organize what is known about BI and make sense of new information that emerges on BI – thereby forming a common BI worldview [33].

While unlikely that there is a single BI worldview, or a single set of characteristics and common assumptions shared amongst BI actors, the literature and case study analysis reveals distinct, recurring characteristics and assumptions shared amongst BI actors. This points towards a dominating BI worldview that distinctly drives and influences BI at this point in time. Characteristics and assumptions identified in the literature and case study in this regard are summarized in Table 4, structured according key worldview elements within a framework, which is discussed next. Literature and case study findings are consolidated for comparative purposes and to avoid repetition.

2.2 Using a Worldview Framework to Understand BI Understanding

Study of the work of various authors [2][26][59][18] conversant on the topic of worldviews, guided the compilation of a framework to analyze BI, as shown in Table 1. The case study investigation is grounded in this framework. Table 3 reflects questions and supporting artifacts used in the case study based on this framework.

Table 1: Worldview Framework

Element: Ontology What is? What is the nature of our world? How is it structured and how does it function? Model of reality (what is/what's perceived) as a whole
Element: Explanation Where does it come from? Why is it this way? Model of the past. Explanation of how and why phenomena arose
Element: Prediction Where are we going? What is expected? Model of the future (always with uncertainties)
Element: Axiology What is right/wrong? What should we strive for? Theory of values. Provides direction, purpose, goals to guide actions, measure of value
Element: Praxeology How should we act? What should guide us? Theory of actions. General principles according to which actions should be organized
Element: Epistemology What is true/false? How is knowledge obtained? What are the limitations? Theory of knowledge. Source of knowledge

Individuals and groups sense, think and act (and thereby cause responses) in reaction to stimuli (e.g. internal and external environment), intuition, revelation and knowledge formulated in a worldview [18]. Philosophers [30] explain

that there is a correlation between worldview, values, actions and behaviour. Actions and behavior lead to outcomes, such as challenges and failure on the one hand, and opportunities and successes, on the other – as reflected in Figure 1 – and in terms of the relationship between the worldview elements and the emergent challenges that result from a particular worldview in Figure 2. As an example within BI, an individual BI professional (e.g. an analyst) reacts to stimuli (e.g. factual data) compiling it into meaningful information (e.g. a BI dashboard) that they can read and interpret (formulating knowledge) – all based on and influenced on their worldview. This results in specific actions (e.g. a decision to go to market with a certain product) and outcomes (profit or loss from the product).

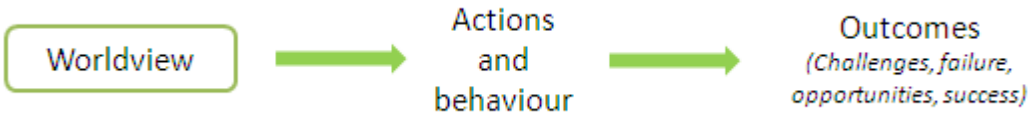

Figure 1: Worldview in context of understanding challenges (adapted from Funk, 2001 [18])

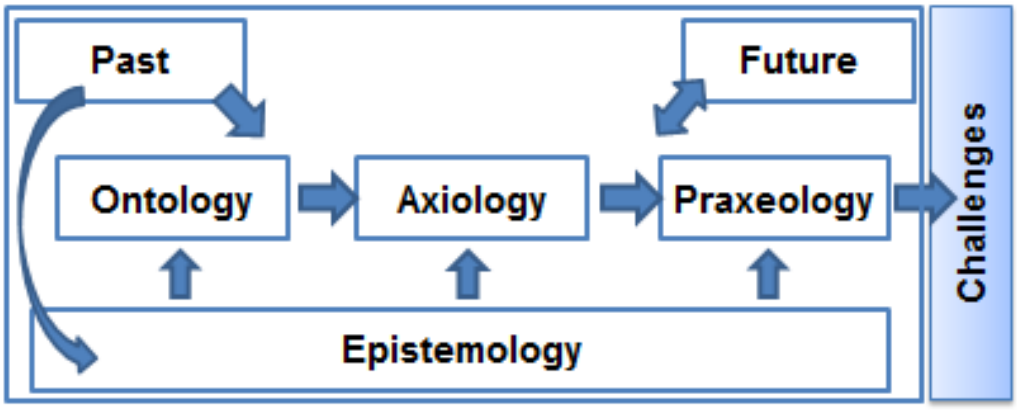

Figure 2: Worldview Elements in Relation

2.3 The Service-ecosystem

Nascent research [35] introduces a service-ecosystems perspective based on S-D logic. A service-ecosystem is defined as a "relatively self-contained, self-adjusting system of resource-integrating actors that are connected by shared institutional logics and mutual value creation through service exchange" [35]. Actors are connected through shared social contexts and are either enabled or constrained by social structures. They integrate operand and operant resources and exchange services to mutually co-create phenomenological value [53]. Operand resources are static resources that must be transformed to cause an effect or provide value [35], e.g. raw materials, data, etc. Operant resources are dynamic and capable of acting on other resources to create value, e.g. knowledge and skills used in value-creating acts [35]. Phenomenological value refers to value that is uniquely and independently measured by the beneficiary, e.g. information received by an executive may or may not constitute timely and actionable intelligence.

2.4 BI as a Service-ecosystem

Consider BI at a conceptual level as the broad series of exchange activities performed with the ultimate purpose of providing actionable information and/or intelligence for use in decision-making [29]. At its core, BI is a resource-integrating system that consists of a series of exchange activities performed by configurations of actors – people, IT, organizations, processes – and shared information connected through exchanges to co-create value (enabling decision-making). This aligns with the definition of a service-ecosystem, as per section 2.4 [41] [35].

Understanding BI as a service-ecosystem provides the opportunity to understand where disputes arise between service-ecosystem entities (actors, agents, resource integrators) involved in these relationships and interactions where these entities do not see value created as intended when a BI product (e.g. information, a report) is delivered or a new BI system is deployed [63]. BI service system entities may include, for example: BI customer; BI provider; the operant resources they create (e.g. insight/intelligence); the operand resources they use (e.g. raw data) and; other organizations they interact with. BI customers are seen as entities demanding benefit (e.g. the ability to use actionable information/intelligence for decision-making [46] in exchange for reward, reimbursement or payment, through

relationships they engage in with BI providers (as their suppliers). BI providers are seen as entities seeking reward, reimbursement or payment and aim to supply the BI customer with benefit.

2.5 G-D and S-D Logic

G-D and S-D Logic are lenses, worldviews or philosophies to view "exchange" [57]. Exchange is the act of giving and receiving [28], which also applies to economic or social acts of giving (e.g. selling, leasing, lending) and receiving (e.g. buying, renting, borrowing). Exchange is concerned with relationships and interactions [49]. The aim of exchange is to give the provider and customer (and others who may potentially be involved) access to resources that provide them with benefit [7].

Vargo and Lusch [57] have called the manufacturing-oriented [39] process of exchange "G-D Logic". G-D Logic typically sees exchange as a linear series of activities of sourcing, producing and distributing tangible saleable goods, designed and built by a producer who embeds the goods with utility and value during the production and distribution processes with a consumer in mind [55] [15]. G-D Logic promotes value-in-exchange and a separation of producer and consumer [23][56], it focuses on the product (including its embedded features), means, producer and production [56] [15].

G-D Logic perceives exchange activities such as leasing/renting and lending/borrowing in terms of the tangible product or unit of output [31] involved. In cases where no tangible product is exchanged, e.g. having a haircut, attending a class or consulting with a lawyer, G-D Logic refers to a service, where service is the residual unit of output [31]. G-D Logic sees service as unproductive and, although not useless or non-essential, as failing to contribute to the creation of wealth [57][57].

S-D Logic is significantly broader than the traditional view of service [52]. S-D Logic questions G-D Logic's traditional views of service and recognizes traditional service as "direct service" and goods as "indirect service" [31]. It recognizes the service that is inherent in goods and, conversely to G-D Logic, defines goods in terms of service. Service is seen as the application of competences (skills and knowledge) through deeds, processes and performances for the benefit of another entity or the entity itself [54]. Skills and knowledge are seen to be embedded in goods, where goods are the transport mechanism for distributing these skills and knowledge [55].

S-D Logic's central tenet is that service is the basis of all exchange [55]. Its primary definition being that service is the application of competences for the benefit of another entity [55]. It sees exchange (including the exchange of goods) as a flow of service where customer and provider collaboratively interact with each other and other economic and social actors to co-create value, which is phenomenologically measured by the customer (and not upfront by the provider) [40]. S-D Logic represents a shift from G-D Logic to a focus on use, the customer, the process, the intangible, the relationship and the doing [37].

2.6 Application of G-D and S-D Logic to BI

This paper examines BI as a series of exchange activities through G-D and S-D Logic lenses. First consider BI through an S-D Logic lens: BI represents an integration point for many capabilities that may exist independently (e.g. in other systems) or may not even currently exist [21] and may still need to be created. For integration to take place, BI relies on various resources (e.g. data, applications, etc.) and actors (e.g. IT, business, BI) to engage in collaborative activities with the purpose of achieving their own interests. For example, a user must interact with data and a BI application to access information to create the intelligence to be able to make a decision. Various actors – BI, IT, the user, the business product/customer/competitor from where the data comes, etc. – and operand/t resources (e.g. data, knowledge) are involved in this. As such, BI represents a highly networked and complex world where a broad range of role players' interests need to be consolidated.

Lusch and Webster [37] argue that S-D Logic is especially useful in such a context. S-D Logic is especially useful for BI as a complex and adaptive environment: it offers a multidimensional view of all of BI's role players, resources, relationships and integration points. It views all social and economic actors as resource integrators [52], broadening the view that BI is all about technology [25].

With this in mind, consider the application of the S-D Logic Foundational Premises (FPs) to BI in Table 2. This is based on a similar example from Schultz and Gnoth [49] who apply S-D Logic FPs to the organization.

Table 2: Foundational Premises: S-D Logic and BI

S-D Logic FP	BI FP
1 Service is the fundamental basis of exchange	Service (exchange) is the fundamental basis of BI
2 Indirect exchange masks the fundamental basis of exchange	Indirect exchange of BI technology products masks the fundamental basis of BI exchange
3 Goods are distribution mechanisms for service provision	BI products are distribution mechanisms for service provision
4 Operant resources are the fundamental source of competitive advantage	Operant resources – such as intelligence and insight (which are hard to copy) – are the fundamental basis of competing using BI
5 All economies are service economies	BI is a service economy consisting of service flows through which exchange takes place
6 The customer is always co-creator of value	The BI customer is always co-creator of value
7 The organization cannot deliver value, but can only offer value propositions	The BI provider cannot deliver value, but can only offer value propositions
8 A service-centered view is inherently customer oriented and relational	A service-centered view is inherently oriented towards the oscillating BI customer-provider relationship, including all entities involved therein
9 All social and economic actors are resource integrators	All social, economic and technical actors are integrators of BI resources
10 Value is always uniquely and phenomenologically determined by the beneficiary	Value is always uniquely and phenomenologically determined by the BI customer (e.g. end-user, sponsor, bank customer, organization)

Second, consider the G-D Logic characteristics of BI. The upcoming case study demonstrates inherent G-D Logic characteristics within BI and establishes that BI tends to follow a G-D rather than an S-D Logic approach – despite the applicability of S-D Logic, as described above. This is also represented in Figure 3 in terms of a typical G-D Logic exchange process. Figure 3 also reflects the typical BI exchange activities (with G-D Logic characteristics highlighted), juxtaposed against the typical G-D Logic supply chain.

For example, instead of the customer always being the co-creator of value (FP6), the customer is often a passive recipient (a G-D Logic characteristic), only getting involved in requirements gathering during a BI project. Another example is the common behavior in BI practice whereby great volumes of data are collected and processed simply because the technological capability exists, with no or limited consideration for an identified need for or use of data [60]. This mirrors G-D Logic characteristics whereby the focus is on the means, production and product [37] rather than on both production and use activities and role players.

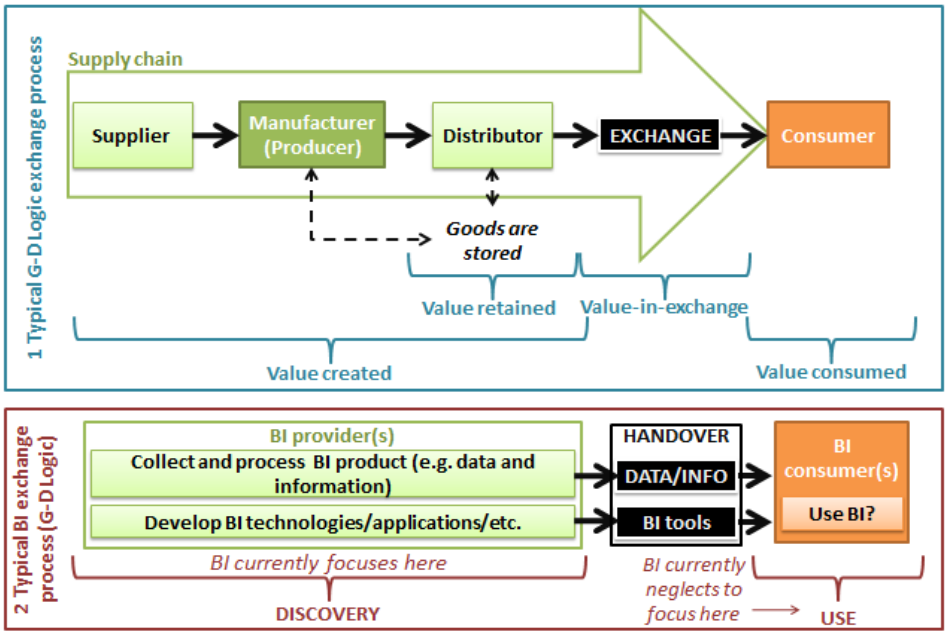

Figure 3: Typical G-D Logic and BI Exchange Processes

2.7 Literature Conclusion

The literature study explained key concepts, positioning BI in terms thereof. These included: the worldview framework, the service-ecosystem and G-D and S-D Logic. This provides the philosophical underpinning needed to better understand BI understanding and BI challenges – to answer the overarching research question (stated in the abstract). The following sections now provide the case study methodology, results and discussion, using the literature study as a foundation. Case study results indicating characteristics of BI's worldview and BI challenges are examined, a dominant worldview is identified and the link between BI's challenges and worldview is explored.

3. Methodology

This research is based on an interpretive 3.5 year case study conducted within a Corporate Banking BI department in a large South African bank, hereafter referred to as Fortune Bank (FB) (A fictitious name assigned to maintain the anonymity) and FB Corporate BI (FBCBI).

The aim of the case study was to understand the interactions, relationships and conduct of BI customers and BI providers working in the BI environment to understand their worldview and what influences and shapes this. Research techniques include interviews, questionnaires and observation – allowing for qualitative data gathering, in alignment with the interpretive approach. The study provided a descriptive analysis and interpretation of the social, organizational and economic world in which the participants – BI vendors and FB – interact. As such, interviews were chosen to elicit direct qualitative answers to questions and observation to look beyond participants' answers into their worldviews. Questionnaires included open-ended questions to gather qualitative and not only quantitative data. Questionnaires were used for BI vendors, as many were geographically spread across the country and globe.

Questions asked in interviews and questionnaires are reflected below in Table 3, alongside FBCBI artifacts used as input to the case study. The South African focus at FB was complemented with a study of international BI vendors – performed using questionnaires. Results from the international vendors were consistent with those from FB, highlighting the validity of the case study results at an international level.

Semi-structured interviews of 14 FB staff members involved in BI as either BI customers or BI providers (e.g. users/business stakeholders employed in other FB departments as BI customers of FBCBI, FBCBI as a BI provider) were performed. Interviews ranged between 1 and 2.5 hours each. Interviewees were selected based on involvement in a core BI initiative and the ability to offer insight based on knowledge and experience of BI at FB or in a similar environment (e.g. work history).

The primary researcher was a full-time employee of FB and could observe the BI environment during the full case study period. She was involved in strategic and operational work in various roles over the course of the case study performing business analysis, training, management of a team of analysts and project managers as well as change, portfolio and project management. By default, as a participant, the researcher is subjective. To mitigate her subjectivity, she noted facts and occurrences separately from judgments and reflections, enabling more neutrality. She also compared observation notes with interview and questionnaire results, finding alignment with the facts.

Interviews and observation research techniques were complemented with questionnaires to South African and international BI vendors (BI providers). Questionnaires were conducted through FB's Request for Proposal (RFP) that was underway at the time of the case study. FB's RFP process was seen as a research opportunity to take advantage of, as the RFP responses provided a direct vendor view of BI. The primary researcher was granted permission to add questions and use the data obtained for her research purposes. FB's RFP aimed to identify a vendor to partner with them to assist them to move FBCBI up a few maturity levels to become a BI Competence Center (BICC). FBCBI already made use of various external BI vendors' hardware and software, e.g. for developing bespoke FBCBI BI applications or as ready-to-use Commercial Off the Shelf (COTS) applications. FB identified vendors to distribute the RFP responses to based on the latest Gartner BI magic quadrant that was available at the time of the case study [48]. FBCBI's senior management team believed this to be representative of BI vendors active in the BI market. 8 out of the 36 vendors who were approached responded to the RFP, which FBCBI management considered a good response. They based this on the fact that not all of the vendors they had identified specialized directly in BI and many had a purely technical focus and were unable to assist from an organizational design and culture point of view, which the RFP called for.

The primary researcher performed data collection and analysis concurrently in an iterative process. In addition to

written recordings of the interviews and the actual RFP responses, engagement with FB staff members and artifacts (documentation, processes and technologies) was carried out, assimilating data and capturing field notes. Literature reviews were continuously performed, substantiating findings and deepening enquiry and data collection. Research notes were codified by flagging and highlighting insights and establishing connections between concepts that emerged in the data. Microsoft Excel tables were used for this. G-D and S-D Logic lenses were then applied to analyze the data – seeking identification of the true underlying problem and insight into potential solutions. The various perspectives that emerged in the research findings were considered, analyzed through a philosophical lens and research findings integrated with those from the literature. Although a rich data set reflecting the voices of the various participants was experienced, a checkpoint was performed after the observation period by informally contacting some of the research participants to enquire the status of the BI department. As a final step, findings and analysis were compiled into a doctoral thesis as the report.

Table 3: Questions and Supporting Artifacts

Element: Ontology Questions: Define BI/the BI process. Indicate handovers, role-players and "deliverables" (as per FBCBI and BI vendor terminology) Supporting Artifacts: FBCBI process documentation
Element: Explanation Questions: What's the history of BI? To interviewees only: How was FBCBI established? To BI vendors: How was your firm established – partner of a software/hardware firm? Supporting Artifacts: FBCBI history (available in a marketing video), vendor website and marketing packs
Element: Prediction Questions: What do you see for BI in the future? Explain for FB and industry/trends. What challenges or improvements do you foresee? Supporting Artifacts: Brainstorming session notes from FBCBI strategic "day away" planning sessions
Element: Axiology Questions: What is the purpose/benefit of BI? How is success measured? To interviewees only: What are FB organizational measures that BI supports? Supporting Artifacts: FBCBI performance measures, BI project objectives and CSFs, FB vision and strategy. Vendor mission statements
Element: Praxeology Questions: What methodologies or guidelines are used for BI or by your organization? Supporting Artifacts: FBCBI and FB methodologies, including FBCBI's Systems Development Lifecycle (SDLC)
Element: Epistemology Questions: Education and work experience background of interviewees. Vendor history (e.g. established as part of an IT organization or purely BI focused, etc.) Supporting Artifacts: FBCBI history (available in a marketing video), vendor website and marketing packs

Note: Questions were directed to both BI vendors and interviewees, unless otherwise indicated

4. Results and Discussion

4.1 Background and Context

Research results consisted of:

- Descriptions and diagrams gathered through responses to open-ended questions in the interviews and questionnaires.
- Field notes based on observation of FBCBI, its stakeholders and its BI vendors.
- FBCBI artifacts as indicated in Table 3.

Research results were captured in Microsoft Excel in tabular form, maintaining the structure as per Table 3 above and meta data such as the source and type of research data. Interview notes were typed up and interview diagrams scanned and notes made in the Excel tables - within a few hours of each interview. Questionnaire results were copied and pasted from electronic responses. FBCBI artifacts were examined and notes were made (in the Excel tables). Data were flagged according to recurring themes that emerged. Comparisons were then done between data sets. Data sets were also compared with the literature study. It was then possible to extract comparable results and findings, as shown in Table 4 and Table 5 below.

Research results indicate, at the time of the case study:

- Interviewees' experience: 2.5 to 28 years' experience in banking and IT.

BI providers (BI vendors and FB BI departments) typically have IT, Engineering and Science backgrounds while BI customers (business stakeholders) typically have Business, Finance and Accounting backgrounds.

Interviewees were involved in strategic and operational BI work (defined in Methodology).

2 of the 8 RFP respondents are South African vendors with 50 people or less in their employ, established for five or fewer years. The remaining 6 RFP respondents operate within South Africa and internationally, each with more than 1,000 employees and over 21 years' BI experience.

4.2 Key Results

Table 4 reflects a summary of the characteristics that are seen to constitute the dominant BI worldview experienced and perceived in practice by the case study participants (flagged as "CS"), alongside the dominant worldview that is reflected in the literature on BI (flagged as "LS"). Table 5 summarizes the key challenges that emerged in the case study, as experienced by the case study participants.

Results represent summaries of in-depth analysis and comparison of case study research data and are supported by Table 3, as a means to explain what was used as a basis to formulate each summarized characteristic. This paper represents case study results at a high level for comparative purposes. Supporting detailed analysis is available in the unpublished thesis that underlies this research [11]. Supporting detailed analysis includes quantitative analysis of results, e.g. 75% of respondents used technology to describe what BI is and therefore Table 4's Ontology section reflects that BI is perceived as a technology. It also includes qualitative analysis based on direct quotations from respondents, e.g. when asked questions about challenges and frustrations experienced in his/her job, a BI provider stated "we produce so many reports, but the business forgets about them and they don't get used". This could be linked to challenges in use – as well as challenges in alignment between business and IT.

Table 4: Characteristics of BI's Worldview per Worldview Element

Ontology	
1	BI operates from an ambiguous and unstable model of reality, where BI is perceived as a: technology, process, product and capability (one or multiple of these perceptions). (LS, CS) [1][20][3][51]
2	BI is generally understood (by BI providers and customers) to consist of a linear series of development or data processing activities up to the point of exchange (e.g. implementation/delivery), potentially including change management. Only a few individuals define BI beyond this point, these typically are BI customers. (CS)
Past	
3	No definitive explanation for uncertainty in BI perceptions. (LS, CS) [45][17]
4	BI emerged from a hard (mechanistic, deterministic) systems and engineering background. (LS, CS) [1][5]
5	FB BI departments were established by individuals with dominant IT backgrounds. (CS)
6	BI vendors were established with an IT focus or by an IT organization. (CS)
Prediction	
7	Technological advances envisioned for the future. E.g. customization and improved delivery mechanisms. (LS, CS) [6][4]
8	FBCBI demonstrated a renewed technology focus by changing its name to BI Technology Services (BITS). (CS)
9	BI customers are concerned about future technology solution's features and functions. (CS)
10	BI providers are concerned with collecting and managing greater volumes of data, expanding their BI target market (audience) and improving delivery mechanisms. (CS)
11	BI providers aim to reduce time spent on data processing to spend more time developing and automating BI technologies. (CS)
12	Frustration is experienced due to customer "meddling", but there is a desire to close the BI customer-provider gap through, e.g.: conversations in business jargon; a new type of BI resource (with expertise in business and IT); longer support periods to equip users. (CS)
13	A return to focus on decision-making is expected – enabled by analytics. (LS) [4][19][32]
14	Data (enabled by technology) is the new driver of BI. (LS)
15	Collaboration and interconnected solutions receive attention. (LS, CS) [4][6]
Axiology	
16	Value is measured by the BI provider at the point of exchange of a tangible BI output. (CS)
17	BI's purpose is seen to be "inform decision-making" but value is measured according to cost, quality and schedule measures on the BI IT solution and implementation thereof. Furthermore, BI is aligned with marketing and banking strategies that target and acquire customers and markets. (LS, CS) [21][4][27]

18	BI vendors don't typically receive feedback on use or performance of their BI solutions. (CS)
19	FB targets customers, selling and marketing to them to bring them onboard as primary banked customers and optimizes its processes to do this as efficiently as possible. (CS)
20	BI vendors promote and value intangible benefits or features of IT solutions, assuming "customer value" is the output of their software development process that takes place upon implementation (exchange) and can be defined unilaterally by vendor, upfront. (CS)
21	BI values the BI environment and applications (neglecting use of BI). (LS, CS) [49]
22	BI's purposes are largely intangible, subjective and hard to measure (ROI). (LS, CS) [44]
23	BI is a top priority/value. BI is for all levels of the organization ("everyone"). (LS, CS) [32][3]
Praxeology	
24	Various strategies, Critical Success Factors (CSFs), frameworks, etc. (grounded in IT) are provided by BI providers to manage, govern and guide the BI environment and its technologies. (LS, CS) [21][62]
25	BI's guiding principles are defined and implemented unilaterally by the BI provider, without interference or influence from the BI customer. (CS)
26	BI consists of a linear series of activities in a software development process or a data warehousing process, guided by relevant IT/data methodologies. (CS)
27	The decision-making process is referred to, but not described. Focus is on delivery of BI technology solution and/or product and the activities to do this. (CS)
28	BI customers don't typically participate in BI solution development unless required to by BI provider e.g. for requirements gathering, User Acceptance Testing (UAT), training. (CS)
29	Agile development approaches are strived towards to increase collaboration within BI departments (i.e. between data, development, analyst teams) and to increase the BI department's productivity and deliver BI requirements at faster response rates. (CS)
Epistemology	
30	BI is informed by various disciplines, science and business functions, but focuses on BI's IT and IS aspects, causing an imbalance. (LS, CS) [1][20][3] [51]
31	BI providers (BI vendors and FB BI departments) typically have IT, Engineering and Science backgrounds while BI customers (excluding FB BI departments) typically have Business, Finance and Accounting backgrounds. (CS)
32	A limitation is identified in the gap between BI customer and provider competencies. (LS, CS) [8][9]
33	When raising challenges, BI customers and providers restrictively focus on their lack of knowledge of the other's expertise rather than on sharing their expertise. (CS)
34	BI flows across the organization, irrespective of business function. BI providers and customers restrictively think of BI in terms of function, creating gaps where BI overlaps between business, BI and technical realm – e.g. business data ill-understood by all. (CS)

Table 5: Key Challenges Identified in the Case Study and Literature Study

1	BI use: BI is not used optimally. The volume of data is overwhelming. BI represents unfamiliar territory for users. There is poor or absent metadata and training. There's a gap between the BI application or output and human decision-making.
2	Managing big data. The volume of data is overwhelming. Storing and accessing big data spread across the organization in various formats is difficult. Managing customer demands for data from new and unstructured resources. Gaps in ownership or responsibility for data or data quality.
3	Integrating BI across many complex technology, data and business layers. BI infrastructure is complex, expensive, takes time and can't be used until most of it is complete.
4	Aligning and balancing the needs of the various role players in BI BI customer and provider are separated. Communication and collaboration fails. BI vendors try to bypass BI departments. Various BI departments and silos spring up in the organization.
5	Recruiting, retaining and using BI personnel and their skills effectively A broad skill set is required (business and technology). BI departments are forced to recruit IS and IT instead of BI experts.
6	Getting the right sponsor in place Absence of sponsor understanding, sponsor "mislead" by BI vendors selling tools that make BI appear a quick and easy endeavor, without taking integration or organization into consideration.
7	Realizing and measuring Return on Investment (ROI) BI success is measured at point of delivery of project or data process, making ROI hard to measure in the longer term.
8	Operating in an ambiguous environment BI is ill-defined and its environment is ambiguous. BI is treated generically the same was as a standard IT project – leading to BI-specific issues being largely overlooked. BI is perceived narrowly as an IS or even more narrowly as a data or IT solution – leading to success being measured by BI vendors' sales volumes or data processing capabilities and recruitment of IS, IT and data professionals instead of BI experts.

4.3 Discussion of Results

Inherent G-D Logic can be identified in many of BI's worldview characteristics. As an example, consider BI worldview characteristic 2 (Table 4). This reflects the G-D Logic characteristics whereby value is perceived in exchange rather than use [24] and a focus on means, production and producer [23][56]. Further examples are presented in Figure 4, which reflects a summarized view of BI's dominating worldview with icons A through D representing G-D Logic characteristics. Figure 4 is based on Figure 2 (above) to show the relationship between the various worldview elements as well as the outcome in terms of the challenges. Figure 4's key links each of these G-D Logic characteristics to BI worldview characteristic in Table 4.

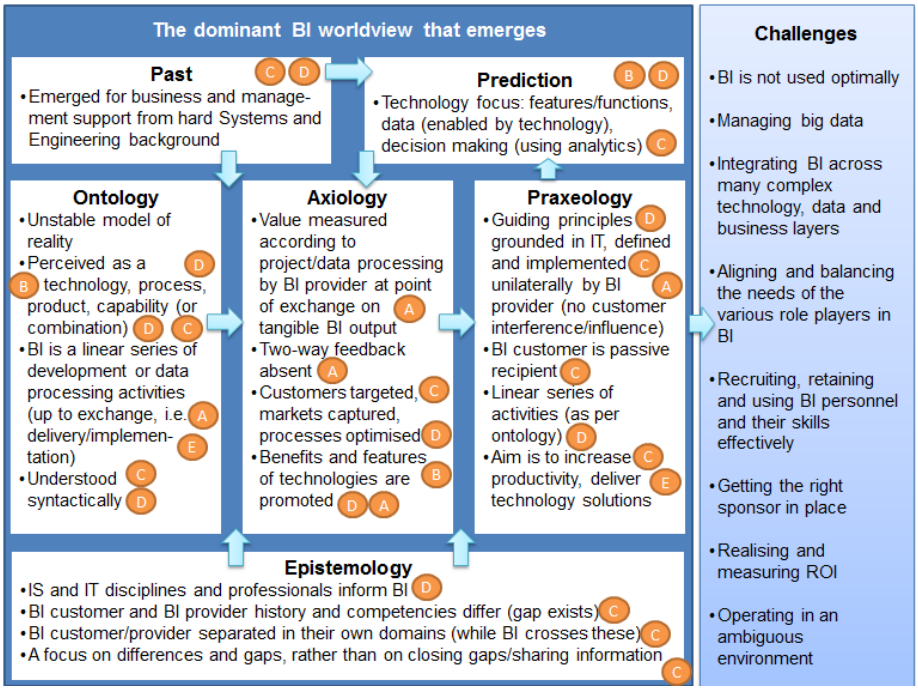

Figure 4: BI's Dominant Worldview Grounded in G-D Logic

Key:

Ref.	G-D Logic Characteristic	Link to Table 4
A	Value in exchange	2, 16-18, 20, 21, 27
B	Compete through goods and their features	2, 7-9, 11, 13-18
C	Separation of BI customer and BI provider	2, 4-6, 9-12, 16, 24, 25, 28, 30-34
D	Focus on means, production and producer A linear production line of activities performed from the BI provider's viewpoint Goods as the output – value determined by BI provider Focus on technology	1-2, 4-8, 9, 10, 14, 16, 17, 19-21, 23-31
E	Focus on "services" rather than "service" and on exchange rather than on BI as a service-ecosystem informed by S-D Logic	1-2

The relationship between recurring themes of challenges and the dominant G-D Logic worldview of BI is also identified. As an example, consider challenge 1 (Table 5) which highlights how focus is on producing (discovery) rather than use, referencing back to Figure 3 where this is depicted. Table 6 provides an example and explanation, drawing from the literature and referencing the icons used above in Figure 4.

Table 6: Example of the Relationship between BI Challenges and G-D Logic Characteristics

BI challenge	G-D Logic Characteristic
BI is an ill-defined discipline operating in an ambiguous environment [1] [20] [3] [51]. This, and failure to consistently recognize or address this [45] [17], results in misalignment, separation and confusion. BI and BI value are then largely defined unilaterally upfront by BI providers, typically operating from a systems and engineering-centric worldview, focused primarily on BI as an IS (or data/IT solution) [45]. A dominant focus on BI technology and its features, processes, etc. overshadows other components and resources that are also needed in BI, e.g. ability to use data/IT solution, relationships, etc. [8]. This focus culminates and then dissipates at the point (or shortly thereafter) where the BI product is implemented (exchanged) [21][4][27].	BI is defined and scoped upfront from the provider's point of view (neglecting and isolating the customer) [24] **C** This leads to passive customers and loss of knowledge of each other's environments and context [16]. **C** BI providers define BI as a linear series of production activities [15][55] **D** that focus on BI technology (as a tool) and its features **B, D** – the means, production and producer [23][56]. **D** Value-in-exchange is perceived rather than value-in-use [24]. **A**

Based on this, it can be assessed that BI's dominant worldview is fundamentally grounded in G-D Logic and that there is a relationship between the re-occurrence of BI challenges and the G-D Logic worldview or approach to BI.

5. Recommendation

Identification of inherent G-D Logic in the dominant BI worldview and identification how the G-D Logic characteristics can be linked to BI challenges leads to the recommendation to further explore applying S-D Logic to BI. This is recommended to determine whether implementation of a service – rather than a goods / manufacturing approach – can assist to overcome BI challenges that result from a G-D Logic approach. Based on the research presented in this paper, it is believed that this is a viable route of exploration. The following benefits of an S-D Logic approach are put forward in this regard:

- A move from focus on BI IT implementation to use of BI in decision-making
- More time spent on analysis/insight than on data processing/software development activities
- Relationship becomes a focus with BI customer and BI provider taking accountability to co-create value – reduced customer passivity/provider rigidity
- Less focus on churning out "deliverables" such as data and BI tools that may not be used/overwhelm users
- Skills and knowledge embedded in value networks result in insight that is hard for competitors to simulate

Furthermore, Table 7 reflects the proposed research agenda for the shift from G-D to S-D Logic for BI, alongside the associated BI FP.

Table 7: Summary of the G-D to S-D Logic shift for BI, based on G-D Logic characteristics identified in BI's worldview and challenges

Reference	G-D to S-D Logic shift	Associated S-D Logic FP
A	Value-in-exchange to value-in-use	6, 7, 10
B	Compete through goods and their features to competition through operant resources embedded in value networks	3, 4, 7
C	Separation of BI customer and BI provider to a customer-oriented and relationship focus	2, 4, 6, 7, 8
D	Focus on means, production and producer to a focus on both production and use activities and role players	9
E	From "services" to "service" and BI as a service flow informed by S-D Logic	1, 2, 5

6. Concluding Remarks

In response to the overarching research question, this paper demonstrates that taking a step back to understand the

model of reality held with regard to BI can indeed lead to a better understanding of BI and its challenges. In response to the secondary questions on what BI's worldview characteristics are and whether it is plausible that these influence or repress realization of benefits, this paper identifies that there is G-D Logic inherent in BI's worldview and that this can be linked to recurring challenges that hinder BI success within the organization. Recommendations are made for further research to explore S-D Logic as an alternative for BI. This is a new and yet unexplored avenue of research for which this paper provides a solid point of departure. A proposed research agenda is provided above in Table 7, where each G-D to S-D Logic shift could be researched and analyzed distinctly, or as an interwoven series. Existing research [10] already provides an example of a study on the shift from production to use, which aligns with research agenda item referenced as "D" in Table 7.

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