CHAPTER 3 PART 1: THE PROMISE AND CHALLENGE OF BI

A literature study: Promise and praise for BI, BI challenges and attempts to solve BI challenges

1. Introduction

BI is highly promoted and praised in the media. Organisations respond to this promotion and praise by investing in BI, expecting significant returns on their investments. Many organisations even list BI as one of their top priorities. Despite this, not all expectations are realised. Instead, there are numerous reports of failed BI implementations and many discussions that highlight the challenges BI faces. What is the reason for this? Why don't all organisations that implement BI reap the promised rewards? What are the challenges that organisations face when implementing and using BI – and what are the reasons for these challenges?

This part of the literature study starts to investigate these questions. It starts by analysing, firstly, the current situation in terms of what is expected from BI (the BI promise) and, secondly, the major challenges preventing BI from consistently meeting this expectation (the BI challenge). It then provides a summary of BI's challenges in this thesis's context as a foundation for the chapters that follow. Finally, it examines existing solutions proposed to overcome BI's challenges.

2. The promise of BI

2.1 Promise, promotion and praise

BI is specifically promoted and praised in terms of the benefits that the organisation is described to gain after purchasing a BI solution. Glancy and Yadav (2011:53) raise underlying business needs for and benefits of intelligence as: profitability; decision-making; questioning; and planning. The most prominent benefit of BI is raised consistently as the enablement and support of decision-making (Bardoliwalla, 2009; Chou *et al.*, 2005:343; Gao, 2006:7; Herschel, 2010a; Hočevar and Jaklič, 2010:95; Marshall et al., 2004:873; Vitt *et al.*, 2002). BI is typically marketed as the means to enable today's organisation to know what is happening now, what is likely to happen next and the actions that should be taken for optimal results (LaValle *et al.*, 2010:3). This ultimately leads to benefits such as an enhanced ability to compete, enhanced communication and collaboration, improved transparency and accountability, elimination of guesswork, faster response to change, continuous innovation and improvements such as an increase in profits, cost and time savings, timely and organisation-wide access to relevant data and better quality and control of information (Atre, 2008; Andersson *et al.*, 2008:30; Ranjan, 2008; Taskov, 2008:3-4; Watson and Wixom, 2007:97; Zeid, 2009:6). BI is no longer seen as just a back-office operation, it is now seen as a competitive differentiator (Kavanagh and Ericson, 2009).

2.2 Benefits of BI

There are countless vendor reports (e.g. from Accenture; Actuate; Business Objects; Cognos; Hyperion; IBM; Microsoft; MicroStrategy; Spotfire; Sybase; etc. to list a few) of business benefits and success attributable to BI tools, technologies and methodologies associated with these. BI vendor propositions typically emphasise intangible BI benefits, such as agility, responsiveness, customer intimacy, information sharing, collaboration, greater employee/customer/supplier satisfaction, single version of the truth, better reputation, improved public relations, etc. (Andersson *et al.*, 2008:30; Eckerson, 2003; Hočevar *et al.*, 2010:115; Macinnes, 2004:20).

Some intangible benefits that the vendors tend to promote seem superficial and restricted to the characteristics or nature of the BI solution itself (e.g. agility, responsiveness, performance) or are reduced to narrow benefits focused on individual decision makers or BI applications when compared to the intangible benefits resulting as an effect of using the BI solution (e.g. improved public relations, innovation, organization-wide synergies). However, all intangible benefits are harder to measure than tangible benefits, are unpredictable and may only be visible after a certain period of using a BI technology (Hočevar *et al.*, 2010:115; Krigsman, 2010; Negash, 2004:185; Vandergriff, 2008:433; Vanmare, 2006:i). Take for instance an idea that may result from use of a BI solution. As ideas are intangible, when examining a product or service (in the traditional sense), one does not think about the ideas embedded in them, but rather thinks about the idea in terms of the product or service (Cortright, 2001:5). This makes it difficult to link the idea to the product or service that has, for example, seen an increase in revenue.

2.3 Heavy investment in BI

Despite these difficulties in successfully measuring BI's Return on Investment (ROI), organisations are still investing in BI (Gonsalves, 2008:1). BI investment continues even despite the global economic crisis (Kanaracus, 2011). Forrester (Kavanagh and Ericson, 2009) reports no reduction in BI activity and an increase in the number of BI projects starting in 2009. Gartner (Kanaracus, 2011) indicates that the BI market continues to grow despite the world economic downturn: spurred on by both customers' demand and aggressive marketing efforts of BI vendors.

In fact, through their heavy investment in BI technologies and solutions, organisations are seen to have great expectations for BI. Predictions are that BI revenues will grow further in coming years with the release of self-service BI products and technologies such as Apple's iPad and Android tablets (Kanaracus, 2011). More than 87% of organisations across the globe have implemented a BI capability and BI has seen a massive global investment (Ackerman, 2005:1, 26; Calof and Wright, 2008:718; Coulonval *et al.*, 2010:3). Glancy and Yadav (2011:49) report that industry's annual investment in BI ranges from $7 to $52 billion (it is assumed that this is U.S. $, as it is not specified), but states that the size of annual investment is a difficult number to estimate since

there is not a commonly accepted definition of BI. This is corroborated by the fact that Gartner (Kanaracus, 2011) reports this at U.S. $10.5 billion for 2010. Irrespective of whether it's USD$7, USD$10.5 or USD$52 billion, BI investment is high and BI continuously emerges as a top business priority.

Trends within the South African banking industry are no different: South African banks are seen to follow the worldwide trend of investing in BI for strategic and tactical decision-making, making significant investments in BI applications, data warehouses and data marts (Vanmare, 2006:1). In a Gartner Executive Programs survey of more than 1,500 Chief Information Officers (CIOs) around the world, it was revealed that BI and related capabilities were rated as the top business priority for 2009 and 2010 (Hočevar and Jaklič, 2010:94). Gartner also identifies BI applications as the most essential technology to be purchased, highlighting how the BI market has recently experienced high growth (Chuah and Wong, 2011:3424).

In addition, BI investment has spread from typically analytical and fact-based industries – such as financial services, investment and trading – to the most typically intuitive and innate industries such as professional sports teams (Davenport *et al.*, 2005:2; Todd, 2009:36). BI is also becoming more integrated within the organisation (Andersson *et al.*, 2008:30) where it is used in various initiatives such as, for example: customer selection, logistics, service, financial management, supply chain, product/service quality, research and strategic planning (Davenport and Harris, 2007:6:24; Davenport *et al.*, 2005:6).

2.4 BI's purpose: solve the historic management issue

The above paragraphs highlight the heavy investment in BI for the purpose of achieving various benefits. The question should now asked, "what organisational needs do these benefits address or aim to address?". Taking a step back and examining these benefits, it becomes apparent that the business benefits that BI is said to result in, do not address anything new (Lönnqvist and Pirttimäki, 2006:32). Instead, they simply address long-standing managerial issues (Mendell, 1997:115-118; Pirttimäki, 2007b:4). Decision-making and analysis of the organisation to improve its performance and predict future trends have always been significant components of conducting business (Azvine *et al.* 2005). Even before the Information Age as it is often referred to (Carlaw *et al.* 2006:634; Zins, 2007:479; Kaipa, 2000:153) organisations have been striving to achieve the benefits BI is promoted for achieving. Gilad (1986) states that organisations have gathered information about their competitors since the dawn of capitalism.

Going about two thousand years back in time – when feudal states and war lords were competing with each other instead of organisations competing with each other – "enlightened rulers and wise generals" gathered intelligence on their enemies (Tzu, 2005:82). Chinese warrior-philosopher, Sun Tzu (Tzu, 1988:vii) dedicates an entire chapter of "The Art of War" to the use of spies to gain

knowledge of the enemy with the aim of achieving great results (Cleary, 1988:165). More recently, but as far back as 1958, in an IBM journal article, Luhn (1958) proposed a "Business Intelligence System" to enable decision-making and organise data and information. His proposal was for the automated abstraction of data from various points in the organisation's key processes, where such data would be encoded into documents and distributed to point-of-need in the organisation. His explanation is akin to today's explanation of BI systems – albeit with less sophisticated technologies, methodologies and distribution methods. In an article on BI trends for 2010, Bardoliwalla (2009) describes Luhn's article as a "brilliant visionary piece", while other authors (e.g. Sabonovic, 2008:5; Mettler, Vimarlund, 2009:255; and Hashmi, 2001) refer to Luhn's BI system as the seminal work on BI.

Since this, there have been numerous solutions, technologies, tools and methodologies offered to enable decision-making, data analysis and forecasting, etc. BI, with its wide and rich history, is – on the one hand – said to stem from Decision Support Systems (DSS), Executive Information Systems (EIS) and data warehousing (Frolick, *2006*:101). On the other, it is said to be unique and have unique characteristics that make it different from Management Information Systems (MIS), Decision Support Systems (DSS), Expert Systems (ES) and Executive Information Systems (EIS) (O'Brein and Marakas, 2007). BI's unique characteristics are described to include: support for business needs that are data intensive, have cross-functional focus, require a process view and require advanced analytical methods (Glancy and Yadav, 2011:48). As these characteristics are somewhat generic, they could also be applied to MIS, DSS, etc. However, it can be said – irrespective of which of these two views is most accurate – BI and other concepts or solutions such as MIS, DSS, EIS, etc. have emerged to enable decision-making, data analysis, etc. – addressing the age-old managerial (and even military) requirement for information management and decision-making.

Additional solutions, technologies, tools and methodologies which have emerged for more-or-less the same purposes are (to list a few): analytics, Customer Relationship Management (CRM), the various types of intelligence – Customer, Product, Competitive, Collective, Strategic, etc. – and Information Management (IM). Within the literature, these terms are frequently used in the context of enabling decision-making, data analysis, forecasting, etc. and are often used interchangeably with the term BI. In addition, the scope of BI has broadened to include further technologies, tools and methodologies such as Corporate Performance Management (CPM) (Cochrane, 2009:38). This broadening of scope is often seen as a self-serving move by system vendors to include their systems/system functionality in the scope of BI, with the view to expand market share and provide end-to-end solutions (Glancy and Yadav, 2011:49) while BI is the "buzz word" and the market is demanding BI solutions. This is evidenced today with the widespread adoption of the term "analytics". Davenport (Henschen, 2010) describes "analytics" as the new buzz word for vendors. He explains that analytics is a subset of BI based on statistics, prediction and optimisation while BI is much more focused on reporting capabilities. Davenport explains that, as "analytics" is a "sexier"

term to use than “reporting”, it is slowly replacing “BI” in many instances.

After the emergence of DSS, MIS, EIS, etc., BI seemed to re-emerge as the buzz word or term of choice again in 1989. In fact, many appear to ignore Luhn’s 1958 proposal for BI, quoting Gartner Analyst Howard Dressner to have “coined the term” rather than Luhn as the father of the term BI. A few examples from many in the literature who quote Howard Dressner or Gartner as the origin of the term “BI” include: Baars and Kemper, 2008:132; Andersson *et al.*, 2008:1; Anandarajan, *et al.,* 2003; Anandarajan, *et al.,* 2004; Burns, 2006; Chou, *et al.,* 2005:341; Cheng *et al*., 2010; Freeman, 1999:72; Olsson and Sandell 2008:25; Glancy and Yadav, 2011:50.

2.5 BI’s failure to consistently serve its purpose

Despite all these solutions, technologies, tools, methodologies, etc. proposed to assist the organisation to make decisions and achieve benefits such as cost savings, increased profits, etc., organisations do not all report to successfully achieve these benefits. Findings from scientific and professional researchers suggest that organisations are still data-rich but information-poor (Celestino, 2012; Gibson *et al.*, 2004; Williams, 2004; Williams and Williams, 2007). Organisations still lack necessary actionable information (Popovič *et al.*, 2010:10). Glancy and Yadav (2011:48-49) go as far as saying that a true BI system does currently not exist. They define a BI system as one that supports business needs and is broader than the tools or the limited scope of current BI systems. The sustained intense investment in BI across industries and across various initiatives within the organisation in response to the heavy promotion and marketing of BI, should be an indication that investors (organisations) are receiving the benefits that are promoted. Instead, there are reports that BI ROI is difficult to measure (Krigsman, 2010; Vandergriff, 2008:433; Vanmare, 2006:I; Lönnqvist and Pirttimäki, 2006:33) and still further reports of major BI challenges and failures.

3. The challenge of BI

3.1 Numerous reports of BI failure

Over 50% of all BI projects fail and the same number of vendors fail to deliver on their promises (Atre, 2011). The intense promotion and marketing of BI often leads to disappointment as not all organisations realise substantial business value from their BI investments. Some organisations find that the benefits that occur in practice are unclear and some organisations fail completely in their BI approach (Coulonval *et al.*, 2010:3; Jensen, 2010; Lönnqvist and Pirttimäki, 2006:32; Oracle, 2010:15; Turban, *et al*., 2007; Vandergriff, 2008:433). Many organisations believe that there is room for improvement in the BI environment (Atre, 2011) and that knowledge workers’ effectiveness needs improvement (HP, 2009:3).

Organisations experience frustration, disappointment and despondency as challenges mount up

on the long road to implement a BI solution, blocking BI success. Deluded expectations that BI is a simple activity of acquiring hardware and software products are shattered as organisations fully experience a BI implementation and discover it is a complex undertaking that requires comprehensive infrastructure and resources, over a lengthy duration (Fuchs, 2006; Watson and Wixom, 2007:96-99). On the other hand, even organisations reported to be benefitting from BI are on the lookout for opportunities to improve and overcome challenges (LaValle *et al.*, 2010:3).

Within South Africa, financial institutions are struggle to realise the value they have invested in BI technology due to the challenges they experience in unlocking actionable BI for decision-making (Ackerman, 2005:1). Based on a study of both European and South African banking institutions, it was established that a number of banking institutions believe that by merely implementing an IT solution for BI, it will be automatically be enabled (Ackerman, 2005:1). This belief is not surprising, based on the mass of vendor-focused literature discussing BI technologies and applications in support of the vendors' products and services (Vanmare, 2006:8). As a result, few banking institutions have implemented and adopted recognised intelligence processes to produce BI output (Ackerman and Wickens, 2001), relying only on IT solutions for their BI.

3.2 Numerous challenges reported for BI

Reports of BI's challenges contribute to its reputation for over-promising and under delivering. Practitioner literature consists mostly of vendors' and research houses' lists of "top ten BI challenges". While academic literature also contains these, it also offers in-depth discussion of individual BI challenges, for example: low use (Buder and Feldon, 2009), futile attempts to collect all data (Davenport and Harris, 2007:6) or absence of the right sponsor (Williams and Williams, 2007). What academic and practitioner literature have in common is that they consistently raise the same main categories of challenges. Challenges within categories of use; data; integration; alignment; personnel and skills and; sponsorship are consistently raised as BI's core challenges by numerous authors (Atre, 2003:2; Hočevar and Jaklič, 2010; Olsson and Sandell, 2008; Pirttimäki, 2007b; Sabonovic, 2008; Simmers, 2004; Willcocks and Whitely, 2009; Williams and Williams, 2007 to list a few). There are, however, many ways in which challenges may be categorised. Hwang *et al*. (2004:3) list challenges in categories such as: project, technical, educational, business, personnel, organisational, and implementation methods and Watson *et al*. (2006:7) use "organisational" and "technical" as their main categories for challenges.

Other challenges that are raised less often include, for example: BI is an ill-defined discipline in an ambiguous environment (largely defined and scoped by vendors operating from an engineering-centric worldview focused primarily on technology) (Ackerman, 2005:1; Celestino, 2012; Coetzee, 2011; Gladwell, 2009); culture (Jensen, 2010; Davenport and Harris, 2007:6); lack of understanding of the necessity for and the use of meta-data (Atre, 2003:2); politics (Morrison, 2010; Ranger, 2006; Oracle, 2010); and standalone BI solutions, piecemeal solutions and stovepipe data (Atre,

2003:2; Kimball *et al.*, 1998:162). Steffen (2009:38) brusquely states that there is a standard list of reasons why BI projects fail, listing the following: inability to meet business requirements; lack of senior management support; poor data quality; inadequate user training; performance problems; and development and testing issues.

Reflecting on the challenges raised in the literature (including examples above) two observations can be made. Firstly, it is apparent that it is acceptable for challenges to be framed either as a problem (e.g. absence of the right sponsor, inadequate training, performance problems, etc.) or in a way where the problem is implied but is not explicit. Examples of the latter are those raised as Real-Time BI (RTBI) challenges by Watson *et al.* (2006:7), e.g. acquisition of new hardware and software; processes and procedures for supporting and managing data feeds from source systems; executive sponsorship and support; etc. In the context that a challenge is defined as "a new or difficult task that tests ability and skill" (Hornby, 2005:231), the researcher believes that both of these ways of framing challenges are acceptable. A second observation is that, although challenges are raised as BI challenges, many are also applicable – some are even more applicable – to Information Systems (ISs).

3.3 The generic nature of "BI" challenges

The challenges (examples of which are raised in the section above) are consistently raised in the literature as *BI* challenges. However, when examining them in more detail, many don't appear to be unique to BI. Instead, they are typical of generic IS and IS project challenges, as raised in academic (Lyytinen and Hirschheim, 1987:257-309; Tallon, 2007:27-268; Venkatesh, *et al.*, 2003:425-478) and practitioner (Project Management Institute (PMI), 2008) literature. Although it is reasonable to accept that BI will experience the same or similar challenges as a typical IS – based on the understanding that BI is a type of IS (Bertstein, *et al.*, 2011; Euromed Marseille School of Management, 2011; Kelly, 2010) – BI is not *just* an IS. It has unique characteristics (Glancy and Yadav, 2011:48) and challenges. In fact, Atre (2003:2) identifies that one of BI's biggest challenges is that organisations treat BI projects in the same way as IT projects.

Unfortunately, BI's unique (or even its specific) challenges appear to be largely neglected in today's literature. This is a finding corroborated by the fact that many (e.g. Atre, 2003:3; Mantfeld, 2005; Williams and Williams, 2007) raise sponsorship – which can be seen as a generic challenge – as one of BI's greatest challenges. There are, however, some online community forums that reflect attempts to highlight BI-specific challenges. For instance, the Pentaho Community's site (Pentaho, 2011) lists a few of what it calls "BI's unique challenges". Firstly, "unfamiliar territory for users" is listed – users struggle to get to terms with BI's particular technology and data terminology. Another challenge is "cost of prototypes" which highlights that, while BI prototypes could alleviate the first challenge and help to quantify benefits or RIO – which is often a challenge on its own – prototypes are normally expensive within the scope of BI. Their third challenge is that build-

ing BI solutions is akin to building a house: BI implementations won't have "usable rooms" until the house/infrastructure is complete. The challenge in this is that BI infrastructure is expensive, takes time and cannot be used until most of it has been completed.

When considering these "unique" BI challenges it becomes apparent that, while these may be valid BI challenges, they are not unique to BI and could possibly be common across a number of IS solutions of a complex nature. The challenges are, however, supported in the literature as "BI" challenges by others who also raise them in this context. For example, Atre (2011) and Kolodner and Even (2009:2-3) highlight business users' confusion in navigating complex and potentially unfamiliar BI solutions designed by technical individuals and Altosoft (2009:7) draws attention to the costly nature of BI solutions. In addition, there is much support for the fact that BI experiences challenges as a result of a complex solution architecture that is expensive to implement and maintain and only usable after significant work is completed (Altosoft, 2009:7; Negash, 2004:183).

Further analysis of the literature reflects that, while there is an apparent absence of literature that raises truly unique or even specific BI challenges, there is an abundance of literature where authors state that the challenges they raise are BI challenges. The researcher reflected on this body of literature to identify what it is about these challenges that keeps authors raising them as *BI* challenges. In doing this, she discovered two things. Firstly, that as BI is a concept that is open to interpretation and is applied differently in different organisations ((Lönnqvist and Pirttimäki, 2006:33; Olssen and Sandell, 2008:29; Sabanovic, 2008: 8-9), challenges which may appear to fit better within IS (or another area such as data management, for example) to some authors may be raised within the context of BI by others. Secondly, the researcher discovered that there are aspects to these challenges that are specifically applicable to BI. Based on this, she identifies that one of BI's significant challenges is operating in an ambiguous environment, which even appears to extend to impact the ability to raise and/or agree on specific challenges for BI.

3.4 BI challenges per category

Further challenges the literature raises as BI challenges are discussed within categories that emerge most consistently in the literature (highlighted in 3.2 above). Main challenges and challenges that contribute towards causing the main challenge are reflected. As such, differentiation is made between resultant and causative challenges – e.g. the challenge of using BI optimally results from an overwhelming volume of data, unfamiliar territory for users, etc. Furthermore, while a challenge is listed under a main category, it may also be applicable to other categories and is not mutually exclusive – e.g. e.g. volume of data, poor/absent meta data and dominant focus on data processing may also be categorised under "data".

3.4.1 Challenge category 1: BI use

3.4.1.1 Using BI optimally

Users do not always use BI systems or outputs (e.g. reports, data) optimally, use them incorrectly or infrequently and often only use a fraction of the available functionality (Oracle, 2010:3; Buder and Feldon, 2009:1; Popovič *et al.*, 2010:13; Sharma and Djiaw, 2011:114). Investment in BI is wasted as organisations fail to apply it in the decision-making process (Laughlan, 2009). A number of reasons why BI is not used or is not used optimally emerge in the literature, these are:

Volume of data that is processed is overwhelming

With IT predicted to be a hallmark of how organisations (banks in particular) interact with their customers in the future (Tallon, 2010:244), even more data collection opportunities are likely toemerge than are currently available. However, individuals (both personnel and the organisation's customers) are already unable to process the massive amount of data and information at the speed at which technology generates it resulting in "data deluge" (LaValle *et al*., 2010:90-91) or "*analysis paralysis*" (Davis *et al.,* 2011:3). Due to this overload, much information is lost or ignored (Stedman, 2010:16), only exceptional conditions are examined (Folinas, 2007:68) or customers choose simpler alternatives (Davis *et al*., 2011:3). Up to 60% of executives say they have more information than they can effectively use. This explains why it often takes managers hours or days to answer basic business questions (LaValle *et al.*, 2010:90-91). It seems that data is collected based on the fact that technology is able to do it, rather than on a need for the data – technological speed distracts from questioning appropriateness of its actions (Willcocks and Whitely, 2009:191).

Unfamiliar territory for users

BI is an unfamiliar territory for users (Pentaho, 2011). Today's typical BI user experience is disorienting, frustrating, complicated and time consuming (Atre, 2011; Popovič *et al.*, 2010:13)). A user with a business focus rather than technology focus typically experiences frustration when trying to navigate complex data warehouse repositories or understand data, structures and terminology embedded in the BI solution by a BI or IT team (Kolodner and Even, 2009:2-3).

Poor or absent metadata and training

When a datamart is built using one business unit's terminology, business rules and structures, a user from another area needs metadata to understand and use it. However, metadata is often absent or the user is not trained on how to use it or the importance of it (Atre, 2003:2; Steffen, 2009:38). Furthermore, training often focuses narrowly on how to use a BI tool rather than on how to leverage the underlying data (HP, 2009:8).

A gap between the BI application or output and human decision-making

A top reason BI is not adopted is that the typical user does not know how to ask the right question, make the correct assumption or understand how to use BI (Hopkins *et al*., 2010:30). The result is frustrated users who cannot get answers ("GIGO – Garbage In = Garbage Out") (Mantfeld, 2005) and a wasted BI investment (Todd, 2009:36). Asking the right question is a precursor to making intelligent decisions and BI software only provides information up to a point (reactive knowledge), human decision-making processes need to be applied thereafter to result in proactive knowledge (Green, 2007:18; Ranjan, 2008:464; Pirttimäki, 2007b:11).

Adapting to use BI to make decisions and difficulties making decisions in BI environments

Another factor to consider is that it is difficult to change from making decisions based on personal knowledge, experience and intuition to making them based on facts (LaValle, 2010:7). Often, where a decision-maker is unable to use BI, the problem is believed to be with the decision-maker (Atre, 2011). However, decision-making within a BI environment is often challenging owing to information that is difficult to use. When under pressure, decision-makers often rely only on instinct and experience, perceiving they save time and believing that, as they've survived business challenges based on instinctive decisions before, that it will always work or is the best approach to decision-making (Todd, 2009:36). As a result, nearly half of all major decisions are still based only on intuition rather than on facts (Davenport *et al.*, 2010:1).

Providing BI that is relevant, timeous and valued by the user

A significant challenge is the delay experienced from when data is created to the time it becomes available for use, although this is often resolved through Real-Time BI (RTBI) (Nguyen *et al*., 2005:162; Azvine *et al*., 2006:4; Watson *et al*., 2006:12). It is only possible to use data effectively when it is accurate, up-to-date, complete and available when needed (Marshall and Harpe, 2009). BI customers want adequate answers fast enough to action a decision (BI Summit, 2012), often discarding new information that enters the decision-making process when momentum has already built up (Ghoshal and Kim, 1986:55). This is compounded as the decision-maker's world is constantly changing, including changes to their business processes resulting from BI implementation (Watson *et al*., 2006:12).

In addition, there are complex interactions between information and its source that influences the way it is perceived and acted upon. The same piece of information can be valued differently when received from different people, for example, a trusted employee *versus* a stranger from another department (*ibid*). KPMG Research (Coulonval *et al.*, 2010:3) confirms that 70% of executives based in the United Kingdom (UK) do not get the right information to make business decisions due to poor timeliness and or quality. These points highlight that BI is context and decision-maker dependent (Herschel, 2008a) as well as dependent on format, source, relevance, usability (of format and BI from the perspective of the user) and timeliness in context of ability to react.

Providing BI that is valued by and suited to the organisation's culture

Organisational culture is a factor that determines, to a great extent, whether or not BI is valued and therefore used. Organisational culture, a soft concept compared with hard concepts such as BI or analytics (Davenport, 2006:9), is a shared set of assumptions, beliefs and expectations that the organisation (or groups within the organisation) have developed while learning and adapting to the internal and external environment (Schein, 1985:5; Grantham, 2000:34). Organisations with an inflexible culture or those that shy away from information sharing and innovation may miss the opportunities that BI offers (Hopkins *et al.*, 2010:30; Imhoff, 2004; Taskov, 2008:3). In addition, factors such as information sharing willingness, ability to specify BI requirements in accordance with partly defined business decisions and willingness to participate in information sharing or organisation-wide data integrity impede on the ability to use BI.

Catering for different user needs across the organisation

BI professionals have tried to group different types of business users, workloads and data types into the same solutions and architectures, only to get disappointing results (Eckerson, 2011). Average users may find BI tools and data repositories too complex (resulting in the tools not being used – becoming "shelf ware") while power or super users find them too limiting (resulting in them using the tools only to populate their own spreadsheets or desktop databases). Today's business environment demands agreement on the meaning of data amongst users whose perspective is skewed to suit individual needs (Folinas, 2007:68) and users' needs differ vastly. Getting the right data to the right decision-maker (Todd, 2009:35) through the right distribution mechanism and in the right format (Alter, 2003:10; Baars and Kemper, 2008:133) are major BI challenges.

Dominant focus on data processing reduces time/capacity for use

Many organisations do little more than try to collect all their data, spending too much time on data gathering compared with analysis (Davenport and Harris, 2007:6; Popovič *et al.*, 2010:13). Figure 4 reflects how South African organisations spend more time collecting data and maintaining spreadsheets, rather than on using it to conduct analysis and gain insight (Morrison, 2010). This is likely to result in a low organisational BI maturity level, unproductive use of BI resources' time, inability to take actionable decisions based on BI (Ericson, 2009:15) and a decrease in the organisation's overall performance (Hopkins *et al*., 2010:29). The dominant focus on data processing ensures the organisation does not mature to a level of sophistication where data management is performed adequately, disempowering it from using BI to answer important business questions (Accenture, 2007; Kimball, 1988:117; LaValle *et al.*, 2010:9). Todd (2009:36) compares this to failing to react to a hostile environment because one is focused on how one's heartbeat or respiration rate compared to historical rates for this.

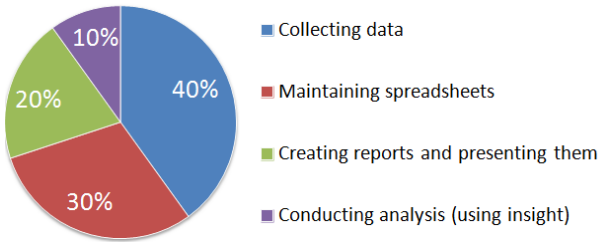

Figure 4: Percentage of time South African organisations spend per BI activity (Morrison, 2010)

Low use overlooked as use is often measured according to volume of software applications and licences sold

Low use of BI is often overlooked as vendors generally testify to increased BI software use, typically equating software sold with software used (Pendse, 2009). In reality, however, BI applications and the related licences become expensive "shelf ware" due to large purchases of BI software that intended users do not use or do not use regularly. Large purchases may be made to qualify for bulk discounts or to cater for anticipated future growth. In addition, BI implementations may be unsuccessful and temporarily or permanently halted after software/licences have been purchased, resulting in no use or reduced use of the BI solution and associated licences.

3.4.2 Challenge category 2: Data

Challenges related to data are consistently raised within literature on BI challenges, possibly resulting from the fact that successful BI is dependent on a solid foundation of data (Atre, 2011).

3.4.2.1 Managing "big data"

The advent of unprecedented "big data"

With organisational information expected to double every 11 months, the volume of data organisations need to manage is exploding (McKinsey, 2011; Zeid, 2009:5). Ironically, a few years ago, organisations saw collection and storage of huge volumes of different types of data collected at different velocities (i.e. "big data" – in terms of velocity, volume and variety) as a technology challenge (Russom, 2011:6). Now, technology has caught up and organisations have moved from having been unable to afford or manage big data to spending their BI budgets on collecting and analysing it (Russom, 2011:4) and struggling with resultant challenges. Section 3.4.1 above already discusses the resultant challenges that impact on the use of BI. This includes the organisation's propensity to focus on collecting and processing as much data as possible, which leads to an unbalanced use of time as well as high volumes of data that intimidate users.

Storing and accessing big data spread across the organisation in various formats/sources

Decision-makers tend to believe information does not exist if it is not organised and ready at their finger-tips immediately when needed (Todd, 2009:36). However, storing and accessing data in-

volves much complexity due to the various formats and types of data sources that are collected (Zeid, 2009:5) as well as the intricacies involved in how the data is stored in the organisation.

Data is now collected from structured, unstructured and semi-structured sources that were previously untapped, e.g. the Internet (Chung *et al.*, 2003:1), social media, web applications, third parties, devices, sensors and data feeds in real time. This includes information disbursed across the organisation in many different formats (e.g. text, images, video, etc.) and from many different sources (ERP, legacy systems, web servers, email repositories, etc.) (Frolick and Ariyachandra, 2006:47). It may be stored redundantly in multiple, disparate data sources where it lacks accuracy, consistency and timeliness (Accenture, 2007; Davenport *et al.*, 2005:7; Atre, 2011; Popovič *et al.*, 2010:13). Furthermore, while BI is fuelled through the use of information aligned with business performance (Green, 2007:18), data is not usually organised or stored according to this or according to analytic competences and disciplines (LaValle *et al*., 2010:3) or the BI questions that may be asked.

Absence of information management methods, governance and data quality

An overwhelming volume of unfocused data often results from failure to plan information (Green, 2007:18; Petrini and Pozzebon, 2009:181; LaValle *et al.*, 2010:9). Information planning is necessary as data are increasing in complexity in both structure and semantics (Nguyen *et al*., 2005:162). Failure to plan contributes to more time spent on integrating, cleaning and managing data, i.e. less time spent on analysis and use activities (Zeid, 2009:5). It also results in clashes between departmental level data requirements and strategic targets. Organisations in this situation tend to start individual BI efforts without consideration for organisation-wide strategic business direction (LaValle *et al.*, 2010:7,13; Davenport, 2006:6).

This leads to interim or rebel solutions and misalignment between different types of users and business functions in the organisation (discussed further in Section 3.4.4). Further data challenges result from this, e.g. ambivalence in data ownership, standalone BI solutions, stovepipe data or piecemeal BI solutions and poor or absent data governance (Atre, 2011; Davenport, 2006:7; Kimball *et al.*, 1998:162).

Lack of planning and governance open the door for poor data quality. In terms of BI, quality is information that is accurate, timely, relevant, complete and consistent (Shanks and Darke, 1998; Wixom and Watson, 2001). Data quality is often listed as one of BI's top challenges (Steffen, 2009:38), highlighting how successful BI is reliant on quality data.

3.4.3 Challenge category 3: Integration

3.4.3.1 Integrating BI across many complex technology, data and business layers

Overlooking integration activities

Significant work is needed to integrate BI with the organisation's existing architecture, data and processes as well as supplier and other external interfaces and applications the BI solution potentially needs to collect data from or push data to. However, integration activities are often considered a "hidden" aspect of BI and are often overlooked or are performed in a rush (Azvine *et al*., 2006:5). BI is not about simply acquiring or developing and implementing BI hardware and software. It involves a comprehensive approach that considers multiple complex relationships, business processes as well as layers of infrastructure and resources across the organisation (Fuchs, 2006; Watson and Wixom, 2007:96-99).

Complexities related to the organisation's technology, data and business layers

Complexities arise as many of the organisation's processes that BI must integrate with are not even documented, referred to as "dark" or unknown processes (Cody *et al*., 2002:697-8; Marjanovic, 2007:1530). Furthermore, integration of different data types and collaboration across the different data and infrastructure layers' languages and protocols increase complexity (Chisholm, 2008). Strategic and tactical data must be integrated into data warehouses in such a way that various query types can still be performed (Daya *et al*., 2009:1; Saggion *et al*., 2007:1; Watson *et al*., 2006:12). Most organisations' IS landscape consists of a complex grid of applications (Schelp and Winter, 2007:1). Not only is integration needed across the various technical layers of the organisation's architecture, but users have different jargon, business terms and data definitions that often affect the speed or ease of integration activities (Folinas, 2007:68).

Complexities resulting from organisation-wide issues

Frustration occurs as organisation-wide issues such as Enterprise Architecture (EA) or organisational strategy are ignored (Chisholm, 2008). There is a general expectation that BI can simply be added to an EA without consideration for other impacts. For example: knowledge of the abstractions and transformations that must take place in the development of the operational solution; existing legacy systems with which the BI solution must operate; how data warehousing architectures designed for batch processing must adapt to handle high velocity volumes and different types of data (Folinas, 2007:49; Chisholm, 2008; Eckerson, 2011). As described above, the Pentaho Community (Pentaho, 2011) compares building BI to building a house, highlighting that BI infrastructure is expensive, takes time and cannot be used until most of it has been completed, highlighting another frustration in this regard.

3.4.4 Challenge category 4: Alignment

3.4.4.1 Aligning and balancing the needs of the various role players in BI

The BI department needs to align with various departments and people in the organisation as well as third parties such as BI vendors, recruitment agencies, third party data suppliers, etc. to be able to provide BI solutions and populate them with the appropriate data. At the same time, the BI department has various customers across the organisation with BI requirements. Misalignment occurs at many levels, between various parties and for various reasons. The literature highlights the following:

Misalignment between BI, IT and the business

There is a fundamental gap in both focus and expectation between BI, IT and business departments in the organisation when attempting BI (Cooter, 2009; Krigsman, 2010). The strained relationship between IT and the business is already well known and documented. When the BI department is added to this, further complications and strain arise.

Conflict arises as IT and/or BI are seen by the business as "the gatekeeper to data and technology" (Atre, 2003), unable to meet business requirements (Steffen, 2009:38) or to focus on understanding BI technology at the cost of understanding the business requirement (Ranger, 2006). The latter may cut BI off from other organisational assets and leads to separation from business customers (Jensen, 2010; Oracle, 2010:3). The relationship is weakened further when the business is brought in as an afterthought when BI or IT makes decisions on BI solutions (Ackerman, 2005:1; Sherman, 2010).

At the same time, IT and/or BI experience frustration with business departments that do not understand their data, don't know their requirements or are unavailable or unwilling (Atre, 2003). BI departments may face added pressure and react negatively to further pressure or new requirements from the business if they are already working on business requirements and providing 24/7 decision support (de Grauw, 2011). Conflict arises between BI and IT when roles and responsibilities are not explicitly clarified and agreed upfront (Cooter, 2009). In such cases, either IT or BI see the other to overstep boundaries, duplicate work and effort or else make assumptions about which department is responsible to complete tasks, resulting in mismatched expectations and later, in BI failures.

Misalignment between BI vendors and the organisation

BI software vendors experience frustration with organisations that fail to achieve an organisation-wide view and objectives, a practice that is said to contribute towards BI failure (Chuah and Wong, 2011:3424).

Misalignment between departments and levels

Conflict may also occur due to differences between departmental level data requirements and strategic targets (LaValle *et al.*, 2010:7,13; Davenport, 2006:6), or where advanced business users set up interim or "rebel" solutions independently from the BI department (HP, 2009:5). In such cases, the users may believe that the BI department is not meeting their needs quickly enough or is not providing the right solutions. They may also simply fail to buy-in to a BI department's "single version of the truth" (SVOT) vision (*ibid*). Unfortunately, interim or rebel solutions typically lead to further misalignment and conflict in relationships as well as challenges related to inconsistent data sources and BI solutions, e.g. different answers to the same questions or lack of senior management support for interim solutions that grow into permanent solutions (Williams and Williams, 2007).

Another source of conflict occurs when roles and responsibilities to use BI are not clearly allocated. Ghoshal and Kim (1986:54) describe the situation where BI is not used for this reason and management believe staff should be using BI and staff think BI solutions have been purchased for management.

3.4.5 Challenge category 5: BI Personnel and skills

Recently it has been advocated that it's not just people who are the organisation's greatest asset, but the knowledge worker and their productivity (Drucker, 1999:135). While this highlights the importance of the human element, it should not be misconstrued that by simply setting up a BI staff complement that BI will be successful (Ghoshal and Kim, 1986:149). If either the right BI skills or the right utilisation of these skills are absent, BI faces challenges (Atre, 2003:2).

3.4.5.1 Recruiting, retaining and using BI personnel and their skills effectively

Specialist personnel are high in demand but short in supply

As is the case with other specialist fields, BI faces challenges in recruiting specialist personnel who are in high demand and short supply, managing the initial learning-curve and then retaining them when staff may wish to move on after gaining specialist knowledge and experience (HP, 2009:5). Davenport *et al*. (2005:7) state that, as more organisations try to compete using BI, the demand for analytical staff grows at an unprecedented rate. This is confirmed by Herschel (2008b), who draws attention to employers' "desperate" pleas for people with strong technology and analytical skills. In a later publication, Davenport (2006:7) states that identifying, attracting, recruiting and retaining the right BI personnel is a challenge for most organisations, making it a differentiating competitive factor when an organisation gets this right.

A broad skill set is required

What makes recruitment a specific challenge for BI compared with other specialist fields or IS is

perhaps not this recent heightened demand and short supply, but rather the broad technical, analytical and business skill set and ability to communicate and interact with all levels in the organisation that is required in a BI resource (Atre, 2011; Howson, 2006). Successful BI depends on BI resources demonstrating hard skills and aptitude to manage complexity and interpret and translate figures and statistics into something that is meaningful in the business world: resources must be able to frame and answer business questions (HP, 2009:5).

3.4.6 Challenge category 6: Sponsorship

3.4.6.1 Absence of the right type of sponsor

Absence of a sponsor who understands BI

This is raised consistently as a major BI challenge (Chuah and Wong, 2011:3424; LaValle *et al.*, 2010:8-9; Mantfeld, 2006; Steffen, 2009:38; Williams and Williams, 2007). Michalewicz (2010) states that many perceive this to be the most important aspect of a BI project. Although this appears to be a generic IS challenge, what is specific to BI is that the right type of sponsor is someone who understands BI (Howson, 2006) and is not under the misapprehension that BI is a quick or easy feat, accomplished through implementation of an IT solution alone (Williams and Williams, 2007). Where a sponsor believes this, they typically fail to get sufficient funding or support and impact on BI's reputation and longevity in the organisation (*ibid*).

In addition, without the right type of sponsor, BI is set up for further challenges. For example: BI opportunities are not even considered as they are overlooked in favour of day-to-day business activities (Stupakevich, 2010); political roadblocks become insurmountable challenges; data quality ownership remains unallocated; measurement of BI ROI is not conducted or is not conducted properly; scoping and prioritisation of BI initiatives become challenging (Atre, 2003:3).

3.5 Summary of BI's challenges

A consolidated list of BI challenges is reflected in Table 2, based on challenges raised within main categories in Sections 3.1 to 3.4 and those briefly touched upon in Sections 3.1 to 3.3. While it is recognised that each challenge reflected in Table 2 may not appear to be a unique or specific BI challenge, the above discussion (at a more detailed level) provides support why the challenge is raised as a BI challenge from within the literature.

As stated above in Section 3.4, the researcher identifies resultant and causative challenges. These are reflected in Table 2 as bold headings reflecting resultant challenges, with causative challenges as bulleted items beneath each of these (with an exception noted in 02). Also as stated above, it is recognised that there are many ways in which BI's challenges may be categorised. Categories in Table 2 reflect just one perception of the main categories based on the researcher's

interpretation of the literature. These categories are used as they provide the researcher with a useful means of comparison for in upcoming chapters in this thesis.

Table 2: Summary of BI challenges reflected in the literature

Key:
Ref – Reference
U – Use; D – Data; I – Integration; A – Alignment; P – Personnel and skills; S – Sponsorship; O – Other;
Z – Out of scope challenges are reflected in Italics

Ref	Challenge
	Using BI optimally
U1	• Volume of data that is processed is overwhelming
U2	• Unfamiliar territory for users
U3	• Poor or absent metadata and training
U4	• A gap between the BI application or output and human decision-making
U5	• Adapting to use BI to make decisions
U6	• Providing BI that is relevant, timeous and valued by the user
U7	• Providing BI that is valued by and suited to the organisation's culture
U8	• Catering for different user needs across the organisation
U9	• Dominant focus on data processing reduces time/capacity for use
U10	• Low use overlooked as use is often measured according to volume of software applications and licences sold
	Managing "big data"
D1	• The advent of unprecedented "big data"
D2	• Storing and accessing big data spread across the organisation in various formats/sources
D3	• Absence of information management methods, governance and data quality
	Integrating BI across many complex technology, data and business layers
I1	• Overlooking integration activities
I2	• Complexities related to the organisation's technology, data and business layers
I3	• Complexities resulting from organisation-wide issues
	Aligning and balancing the needs of the various role players in BI
A1	• Misalignment between BI, IT and the business , BI vendors and the organisation and between departments and levels
A2	• BI infrastructure is complex, expensive, takes time and cannot be used until most of it has been completed
	Recruiting, retaining and using BI personnel and their skills effectively
P1	• Specialist personnel are high in demand but short in supply

Ref	Challenge
P2	• A broad skill set is required
	Getting the right sponsor in place
S1	• Absence of a sponsor who understands BI
01	Measuring ROI • Realising and measuring ROI
02	Operating in an ambiguous environment • BI is ill-defined and its environment is ambiguous • Treating BI the same as an IT project • These challenges result in: Difficulties in raising BI specific challenges
Z1	*Generic IS and IS project and implementation challenges* • *Performance problems* • *Development* • *Testing*

** Challenges referenced as Z1 are out of scope as this thesis is specifically directed at BI's challenges and not generic IS implementation challenges.

4. Attempts to solve BI's challenges

Before examining BI at a deeper level to determine possible reasons for its challenges (as is done in sections and chapters that follow) – it is necessary to question what has already been done to overcome these challenges. This section discusses some examples of existing approaches to overcome BI's challenges that are currently available in the literature. It should be borne in mind that the the intention is not to provide an exhaustive list, but rather an indication of the current state of attempts to resolve BI's challenges.

4.1 Critical Success Factors (CSFs)

An approach that emerges consistently as a resolution to BI's challenges in the literature is the CSF. While CSFs alone are a representation of measures and need an overarching management approach to be used to successfully plan and control, CSFs are seen to be useful as they can be understood by a wide audience, "executives, managers and IT professionals" (Arnott, 2008). The Business Dictionary (2012) defines CSFs as characteristics, conditions or variables with a direct and serious impact on the effectiveness, efficiency and viability of an organisation, programme or project. This dictionary states that CSFs must be performed at the highest possible level of excellence to achieve intended overall objectives, referring to Key Success Factors (KSFs) or Key Result Areas (KRAs) as synonyms.

Lists of CSFs – frequently appearing as "top ten" or "top five" lists – are abundant in the literature

and, when juxtaposed with the challenges, appear to offer the antidote to the challenges. Papadopoulos and Kanellis (2010:16) highlight that BI implementations are typically accompanied by lists of CSFs, such as those provided by Miller *et al.*, (2006) and Ranjan (2008:461-475). They raise that these approaches seem to isolate single success variables such as strong executive sponsorship, organisational accountability, etc. Glancy and Yadav (2011:51-52) echo this sentiment, while raising similar examples of CSFs. As with the BI challenges raised in the literature, many of the CSFs are also applicable to ISs in general, e.g. user support, effective communication, clear requirements. Each main challenge category (excluding 01 and 02) is supported.

Table 3: Relationship between BI challenges and BI CSFs

Examples of CSFs	Support from the literature
Using BI	
• Change management (overcome resistance) • User support and training • User participation and involvement • Organisational culture that supports BI use	• Ariyachandra and Frolick (2008:116-117) • Glancy and Yadav (2011:51-52) • Howson (2006) • Wixom and Watson (2001:20) • Yeoh and Koronios (2010)
Managing big data and integrating BI across the organization	
• Meta-data • Data management, standardisation, quality and maintenance • Solid data warehouse or source as a firm foundation • Existing data management as infrastructure • Iterative BI project planning methods (to repeatedly transform data into information) • Leverage off of existing data and applications • Internal needs of the organisation	• Ariyachandra and Watson (2006:4-6) • Atre (2003:6, 7) • Barrett and Barton, (2006) • Glancy and Yadav (2011:51-52) • Hawking and Carmine (2010) • Hwang *et al*. (2004:13) • Moss and Atre (2003) • Venter (2009:152-156) • Wixom and Watson (2001:20)
Aligning and balancing the needs of the various role players in BI	
• Clear link to business strategy • Align BI with business, across organisation • Organisational accountability and representation • Alignment of organisational dimensions (e.g. technical infrastructure, human capital, organisational culture, etc.) with BI ob-	• Ariyachandra and Frolick (2008:116-117) • Arnott (2008) • Atre (2003:6, 7) • Hawking and Carmine (2010) • Hwang *et al*. (2004:13) • Moss and Atre (2003)

Examples of CSFs	Support from the literature
jectives • Combine BI with other corporate performance measurement tools • Cross-organisational collaboration • Effective communication • BI development methodology • Use of a good project methodology • BI development methodology linked to cross-organisational requirement • Clearly identified and specific information needs • Clear requirements • BI must not be IT-driven • Focus on core business issues or competencies • Use of champions	• Papadopoulos and Kanellis (2010:16) • Politano (2007) • Venter (2009:152-156) • Vessel (2005:27-30) • Wixom and Watson (2001:20) • Zeid (2009:10)
Recruiting, retaining and using BI personnel and their skills effectively	
• Appropriate BI skills • Available and adequately skilled resources • User support and training	• Ariyachandra and Frolick (2008:116-117) • Atre (2003:4-5) • Wixom and Watson (2001:20)
Getting the right sponsor in place	
• Business and management involvement, sponsorship and support • Business representatives/champions • Strong executive sponsorship • Drive a BI solution by way of a framework of intangible valuation areas • Top management support	• Ariyachandra and Frolick (2008:116-117) • Arnott (2008) • Atre (2003:4-5) • Biehl (2007: 52-58) • Eckerson (2006) • Glancy and Yadav (2011:51-52) • Hwang *et al*. (2004:13) • Papadopoulos and Kanellis (2010:16) • Wixom and Watson (2001:20)

It seems logical to simply apply the inverse of a challenge to resolve it. For example, where lack of BI sponsorship is identified as a challenge, highlight adequate and appropriate sponsorship as a CSF. However, the existence – or even implementation and practice – of CSFs does not appear to have solved BI's challenges. Although CSFs should be conducted at the highest possible level

of excellence to ensure success – or at least have a good chance of success – CSFs are not resulting in BI success or consistent success. Consider the following arguments from the literature and alternative suggestions to the CSFs to resolve BI's challenges.

4.2 Actor-Network Theory (ANT)

Papadopoulous *et al.* (2010:25) criticise the narrow scope and fragmented view that the typical CSF approaches offer, stating that these offer little or no help to those in need of a holistic and systemic approach to BI implementation. They go on to state that success and failure cannot be confined to "*a-priori* determined" (italics in original text) CSFs but that success is based on a holistic and complete understanding of the various issues and agendas. Papadopoulous *et al.* (2010:25) propose Actor Network Theory (ANT) to enable boundaries to be drawn over an otherwise large implementation landscape and manage it successfully.

Their research contributes to the body of knowledge on BI implementation as it reflects human and non-human actors and networks involved in the various implementation phases of a BI solution, up to training and maintenance. Furthermore, it highlights that a persistent connection is needed from the level of data to that of business strategy. Unfortunately, their research is restricted to BI implementations and does not address one of the key challenges of BI – use. In addition, their research does not link resolutions back to the key challenges experienced. It may be useful to continue and extend their research of ANT within the scope of post-implementation *use* of a BI solution. However, an extension towards ANT is beyond the scope of this thesis.

4.3 Multi-faceted solutions using CSFs

Wixom and Watson (2001:19) provide further criticism of the individual CSFs, stating that simply applying one, multiple or even all CSFs does not guarantee BI success. They (*ibid*) advocate that resolution of BI's challenges should be treated as a multi-faceted construct where multiple appropriate CSFs (based on objectives and the context of the research phenomenon) are considered alongside possible relationships between CSFs in a dimensional research model.

However, even Watson and Wixom's approach – which is more comprehensive than the CSFs alone – can be seen to be insufficient to achieve BI success. Nandhakumar (1996) and Bussen and Myers (1997) – in similar but separate studies to each other – advocate a deeper analysis of CSFs. They state that a study of static CSFs (individual or in relationships) is insufficient for explanation of system outcomes. They recommend analysis of CSFs in conjunction with historical, political, social and economic factors as well as factors such as organisational context, culture, planning, strength of needs, BI maturity phase and phase of implementation.

This provides a necessary view on the social aspect of BI implementations. In addition, Nandha-

kumar and Bussen *et al.*'s research provides insight into how CSFs can be used, the interrelationship between CSFs and the influence and importance of the CSFs during the BI project. However, it is limited to BI projects up to the point of BI implementation – much like that of Papadopoulous *et al.* (2010:25).

4.4 Critical Contextual Success Factors (CCSFs)

Further authors (Olbrich *et al.,* 2012:4148) agree that CSF literature, while revealing, is insufficient. They state that existing studies only focus on the importance (relevance) of a factor, missing important management issues such as uncertainty and controllability. They recommend that the context in which CSFs apply is taken into account, providing a study of Critical Contextual Success Factors (CCSFs). They define CCSFs as factors outside BI system implementation and maintenance which influence BI system success – either positively or negatively. The authors provide a list of 27 CCSFs, examples of which are: corporate strategy, IT budget, influence of IT on corporate strategy, frequency of product innovations, IT literacy of employees, etc.

Although the provision of context in the form of relevance, controllability and variability for CSFs undeniably adds a multi-dimensional depth to the traditional study of CSFs, Olbrich *et al.*'s (2012:4148-4155) study centres on CCSFs within environmental and organisational parameters of designing a BI system (or IS). As such, these focus on the typical systems development lifecycle activities of designing and implementing a system and neglect the use of the system once implemented.

4.5 BI Maturity Models (BI MMs)

Still further authors (Chuah and Wong, 2011:3424, 3427) explain how BI MMs could be used to guide and plan large-scale BI implementations, thereby increasing the probability of success. BI MMs (also referred to as Maturity Assessment Models) may be used to assess and evaluate capabilities of organisations in the field of BI (Raber *et al.*, 2012:4226). Rajterič (2010:47) highlights how they can be used to justify BI system investment. There is considerable overlap in the work of Chuah and Wong and Rajterič who provide examples of BI MMs such as The Ladder of BI (LOBI); Williams and Williams' (2007) BI MM; AMR Research's BI/Performance management MM Version 2; and The Data Warehouse Institute's (TDWI's) MM.

Further examples of BI MMs can be found in practitioner literature (e.g. from Gartner (2008) and Forrester (Forrester Research, 2010)) and literature provided by various consultancies and vendors (e.g. Accenture, IBM, SAP, etc.). Gartner (2008), for example, provides a list of maturity stages and characteristics that can be evaluated and measured to determine the phase of maturity that the BI department or organisation being measured fits into. Characteristics include, for example: Total lack of awareness (of BI), limited users, BICC in place, spreadsheet and information anarchy, effective use by users driving business strategy, etc. Their aim is to assess existing ma-

turity, map out planned maturity and plan the steps to close the gap between existing and planned levels of maturity. While this can be useful – BI MMs can provide a baseline for comparison – the available BI MMs tend to focus on a specific viewpoint and problem domain (Rajterič, 2010:47).

This is echoed by Chuah and Wong (2011:3424, 3427) who state that BI MMs or even a combination of these MMs fall short of solving BI implementation problems. According to their research and analysis, most of the maturity models do not consider all factors affecting BI, some focusing only on data warehousing and others on knowledge management, for example. Instead, Chuah and Wong request an integrated MM that includes factors such as: user satisfaction; user readiness for further development; system acceptance; system quality from the content viewpoint; customisation to specific user group; etc. Mention of factors such as user satisfaction, user readiness, system quality and customisation highlight that, unlike other approaches discussed above, Chuah and Wong have insight of the fact that there is a need to address the challenge of BI use. Chuah and Wong are successful in identifying this gap that needs to be filled.

Raber *et al*. (2012:4219-4221) also find fault with existing BI MMs, highlighting that, while there are numerous BI MMs that are proposed in the literature, these share common weaknesses. For example: poor theoretical foundation, absence of documentation and methodology, unclear specification of the BI maturity concept and absence of evaluation with real world scenarios. Raber *et al*. (2012:4226) propose a BI MM based on an explicit maturity concept and transparent construction, based on technical and business related aspects of BI.

Another example of how models may be applied to improve BI is from Goul and Corral (2007:915) who suggest improving decision support by analysing the organisation's context (e.g. its data warehouses, knowledge and model management) through an Enterprise Model Management (EMM) lens. In congruence with the proposal of Raber et al., Goul and Corral's proposal involves the complete context of the systems, people and processes engaged in activities impacting an organisation's state of affairs.

Again, although these BI MMs and model applications may overcome many of the shortcomings identified in existing BI MMs and approaches, they do not specifically address BI's challenges and are not explicitly applied to the full BI service flow – from data gathering to use of BI for decision-making, As such, the existing BI MMs and model applications are identified to be ineffective in addressing the research presented in this thesis, i.e. to assist BI to overcome its prevailing challenges.

4.6 BI frameworks

Much research has been conducted on the topic of BI frameworks (Liyang *et al.*, 2011:1025). Despite this, the term "framework" is used ambiguously within the literature on BI. It is used inter-

changeably with terms such as architecture, environment, model and even value chain (e.g. Huggins, 2010; Eckerson, 2003; Liyang *et al.*, 2011:1025-7; and Viaene, 2008:29 respectively). Within this thesis, a BI framework is considered to be a broad set of ideas and principles based on relevant fields of enquiry, used to provide structure and a coherent view of the topic or research phenomenon (adapted from Reichel and Ramey, 1987).

The emergence of BI frameworks

BI frameworks within academic literature appear to emerge as improvements in response to identified inadequacies within an existing framework or system or in response to a new demand or opportunity. Examples of the former are of Xie and Zhou's (2008:3) BI system framework based on RosettaNet Frame and of Folinas' (2007) conceptual framework for BI based on business activities monitoring systems. Both of these identify shortcomings in existing frameworks and offer their frameworks as improvements. An example of the latter is of White's (2009:12) Enterprise Framework which presents a response to increased BI processing needs, the emergence of the information worker audience and advancements in technologies. Further examples of the latter can be found in the responses to developments such as Open Source, Service Oriented Architecture (SOA), Enterprise Architecture (EA) and even Software as a Service (SaaS). Examples of these are of Baars *et al.*'s (2007:1162) BI outsourcing framework that incorporates Information Technology Information Library (ITIL) service phases, Essaidi's (2010) open source on demand BI services framework and of Liyang *et al.*'s conceptual framework for BI as a software service (SaaS BI). Each of these frameworks provides structure and guidance for BI, from a technical or system viewpoint, in terms of development (Open Source, SOA, EA, etc.).

The technical or system viewpoint is also identified as a typical viewpoint of contributions towards SOA research. Although extensive contributions are made to SOA research, these typically focus on technical or deployment issues and neglect business issues or inter-organisational integration (Schelp and Winter, 2007:1-2) – which can also be seen in typical frameworks related to BI in terms of SOA.

In contrast, some BI frameworks are provided without justification of a requirement or identification of inadequacy. Examples of these are of Bowman's (2011) BI framework and Kimball's (2011) high level BI framework (although titled "BI framework", it is focused only on data). In these cases, the credentials of the author or organisation are promoted – potentially providing enough credibility for loyal followers or customers (e.g. Kimball is a household name in data warehousing) who may adopt the framework.

Practitioner vs. academic BI frameworks

BI frameworks within practitioner literature follow many of the same themes. However, a distinction can be made: practitioners tend to provide product-specific architectures. This is not a recurrence within BI's academic literature on frameworks. An example is of Microsoft's Media BI

framework (Microsoft, 2008), consisting of Microsoft products such as SQL servers, ProClarity front-ends, Excel spreadsheets and SharePoint collaboration tools.

Broad categorisation of existing BI frameworks

The literature's BI frameworks tend to focus on managerial and technical concepts and, in many cases, just technical concepts. Both of these broad categories focus strongly on data and the process data follows from being sourced to being presented (e.g. Kimball, 2011; Watson and Wixom, 2007:97). However, while there is much literature that focuses on data warehousing and the BI lifecycle, there appears to be a trend that is emerging towards emphasis on presentation through analytics or visualisation tools (e.g. Davenport et al., 2010:10). Swarbrick (2007) identifies this and even pleads for a return to a focus on data warehousing as the "workhorse of the BI effort".

Managerial concepts typically include concepts such as data governance, information management, top-down or bottom-up types of approaches, programme management, Key Performance Indicators (KPIs), etc. An example of a typical framework encompassing management and technical concepts is reflected below in Figure 5. Some BI frameworks that reflect managerial concepts also demonstrate consideration for the various domains of intelligence. An example of this is from Eckerson (2011), this time entitled the "BI Delivery Framework 2020". Eckerson admonishes approaches of the past as "one-size-fits-all" and pleads for a move to a more flexible BI architecture. He then provides insight into what he calls the "information factory" which transforms data into information and information into insights and action in a virtuous cycle that supports the learning organisation, harnessing of information as a competitive advantage and quick adaptation to new events and conditions. Eckerson (2011) reflects the different types of intelligence as domains that need to be captured. Technical concepts typically consist of concepts regarding the BI architecture, platform, applications, tools, reports, development lifecycle, visualisation tools, data security, etc. An example is reflected below in Figure 6.

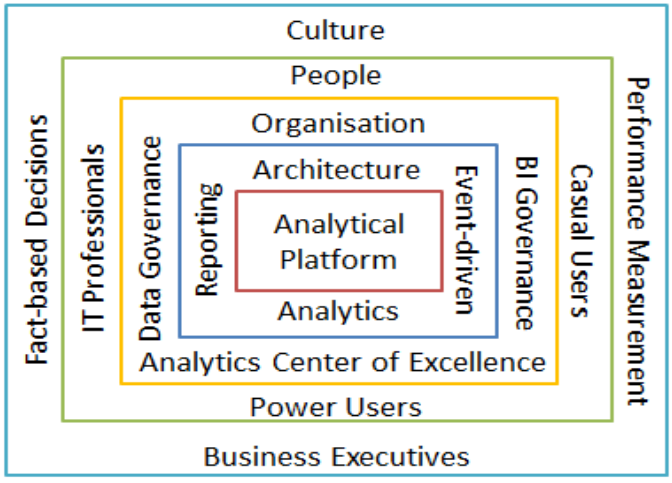

Figure 5: Big data analytics framework - showing management and technical concepts (Adapted from Eckerson, 2011:12)

Inadequacies of existing frameworks: observations

The sample of BI frameworks is provided above as a representation of the BI literature that is available on frameworks. Observations are now made on the inadequacies of the existing frameworks, using this sample to highlight and demonstrate these inadequacies.

The BI challenges – as raised in sections above – remain largely unaddressed by existing BI frameworks. Existing frameworks tend to focus dominantly on technical aspects of BI rather than softer issues such as use, sponsorship, skills and resources or alignment between BI and IT. Although there is a focus on data, the frameworks do not offer direct solutions to data overload, data quality issues or ways to move BI from the space it appears to be in, where data is collected but not used.

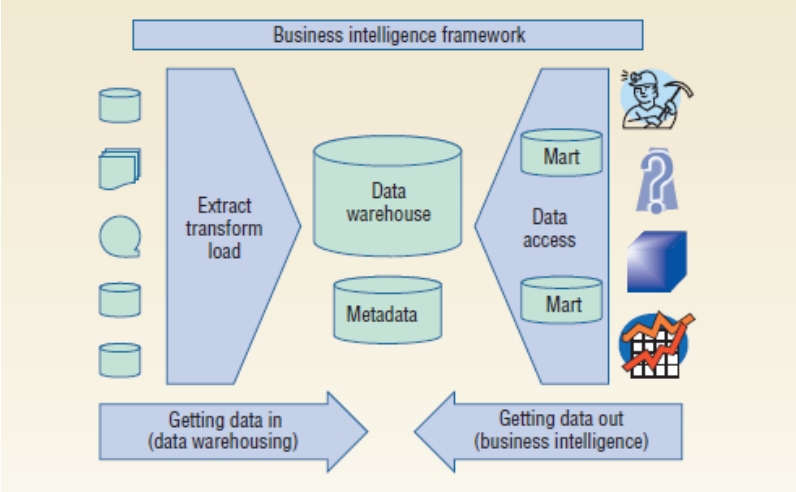

Figure 6: BI framework depicting data and BI components (Watson and Wixom, 2007:97)

BI practitioners (including vendors) tend to become product or brand specific, providing either what can be described as a technical architecture of their products (e.g. Microsoft) or a framework that lacks context and justification (e.g. Kimball's BI framework consisting of only data components). This highlights that existing frameworks provide only for fragments of BI and not the whole BI process. Frameworks encompassing all elements of BI – from data to decision-making where the decision-maker is involved as a human element – appear to be neglected in the literature. This is emphasised by Eckerson's (2011) BI Delivery Framework 2020 which reflects the "information factory" approach. This approach reduces BI to a technology-driven information processing output unit, much like an industrial unit producing pre-configured units of output. In this case: information. Paradoxically, Eckerson pleads for a shift from "one-size-fits-all" with this factory-made approach.

In providing only for isolated fragments of BI, all actors involved and impacted by BI are not considered. Actors involved in the BI process may include technology actors, human actors, organisational actors, etc. There is no framework readily available that includes the man-on-the-street consumer (or the stakeholder of the BI project) as impacted by BI or as someone who can give BI feedback, other than as perhaps a type of intelligence that should be captured. However, legisla-

tion governing the consumer and the consumer's information has a direct impact on BI, including BI systems, governance and BI processes.

BI frameworks tend to stop at the presentation layer (e.g. analytics) or with BI implementation and limited post-implementation training and support. However, an interview with Thomas Davenport (Henschen, 2010) reveals that this gap has already been noticed. Organisations recognised to be "really good at analytics" have stopped simply buying technology and now insist on analytical consulting during the use of the technology solutions. Unfortunately Henschen and Davenport do not indicate the period that this would be applicable, but the gist of their discussion implies that it is more than simply extended post-implementation support. This is echoed by Bormann (2007) who indicates that the client-consultant relationship has risen in importance and that, long after implementation, BI consultants are needed to assist clients to use their BI solutions.

4.7 Business Intelligence Competence Centres (BICCs)

Many organisations react to BI's challenges by establishing a specialised unit for running and supporting BI solutions called a Business Intelligence Competence Centre (BICC) (Baars *et al.*, 2009:2; HP, 2009:5). The BICC is seen as the "corporate team" (Eckerson, 2011) that is the connection between the business and technical worlds of BI. It is defined as a permanent body of cross functional members with specialised competences who are responsible for leading, managing and performing all aspects of an organisation's (or a unit's or a department's) BI – including all strategic, project and operational aspects of BI (adapted from Breddam and Day, 2008:6). The most important competency of the BICC is understanding and improving the analytic capabilities of the organisation (HP, 2009:15).

The BICC may be structured according to a number of different models. It may be developed as an IT department, an operations department, it may be outsourced, it may be distributed or centralised – it may even be a virtual BICC that consists of people from departments across the organisation performing their BICC role on a part-time basis. It connects people from business, IT and BI who specialise in the various BI competences needed. It aims to provide a central reference point for BI, unify disparate BI efforts and silos of data across the organisation and efficiently and consistently provide for BI requirements (Breddam and Day, 2008:6-7). Examining these aims shows that the BICC attempts to solve some of BI's long-standing challenges. For example, establishment of a BICC reflects that the organisation recognises that BI is a unique discipline requiring BI, IT and business collaboration that needs a long-term programme – and not just an IT project (Eckerson, 2011). This demonstrates efforts to resolve sponsorship and alignment challenges. Breddam and Day (2008:8-9) indicate that the BICC can be used to address the challenge whereby business users spend most of their time preparing reports and limited time on proactive use of BI to encourage a culture of an information-driven organisation.

Based on these descriptions and definitions, it seems that the BICC is the solution to BI's challenges. However, BICC adoption is reported to be slow, with many organisations testing the water by first establishing virtual BICCs, partly as a result of team members' existing responsibilities and the resultant inability to focus solely on BI work (Techtarget, 2011). Currently there is much interest and research into: which model of a BICC works well under specific conditions; how to distribute competences among users, IT and BICC sides and; how interfaces need to be crafted (Baars *et al.*, 2009:2). In addition, there appears to be a connotation that a BICC is only for organisations that are at a certain level of BI maturity with business users that take ownership of the function, possibly contributing to this slow uptake (Eckerson, 2011).

Like BI, the BICC appears to have its own challenges (and corresponding CSFs). Many of these appear to be generic challenges that typically occur when a change is made or a new department is created. For example: false starts; resistance to change; lack of acceptance or credibility across the organisation; ill-defined outcomes; lack of consensus on BICC structure leads to funding, resourcing and reporting challenges; unclear leadership; imbalance between business, BI and IT staffing; lack of management support; etc. (HP, 2009:15). There are also some more specific to the BICC, e.g.: lack of business ownership; lack of sponsorship; data quality challenges; unclear requirements; lack of available skilled staff; etc. (Breddam and Day, 2008:22, 27).

The paradox is that, as many of the BICC's challenges are common between BI and the BICC, trying to resolve BI's challenges through establishment of a BICC may simply imply facing the same challenges through a different mechanism or in a different guise.

5. Conclusion

This part of the literature study chapter reflects that, although there is much expectation set for BI, it does not always deliver accordingly. It identifies that decision support is seen as BI's primary purpose and that this is a long-standing managerial need rather than a new requirement. The multitude of reports of BI failure and BI challenges are then addressed. It is identified that although the literature consistently raises specific challenges as "BI" challenges, that many of these are in fact, generic IS challenges. Core challenge categories are identified as: BI use; data; integration; alignment; BI personnel and skills and; sponsorship. A summary of BI's challenges in use is then provided for discussion in the chapters that follow.

Existing solutions to BI's challenges are then discussed, namely: CSFs and variations and combinations of these, Actor-Network Theory (ANT), BI MMs, BI frameworks and the BICC. It is identified that existing solutions may have had some effect, but are generally ineffective in resolving BI's core challenge that it is not consistently delivering as expected.

The next part of the literature study chapter takes a step back to gain a better understanding of BI

by examining characteristics that constitute a BI worldview. This provides a new approach to understand BI's persistent challenges.

CHAPTER 3 PART 2: UNDERSTANDING BI'S WORLDVIEW

Understanding BI's worldview as a new approach to BI's persistent challenges

1. Introduction

A sore throat may be a symptom of the flu. Treating it in isolation may result in some relief, but this will, in all likelihood, be temporary. Either the sore throat or another symptom of the flu is sure to re-emerge, until the flu is cured. In a simple comparison with this, consider that BI's challenges are manifestations of a greater underlying problem or problems. Current approaches to resolve BI's challenges tend to fall short of consistently resolving the underlying problem, evidenced by the persistent and recurring characteristics of BI's challenges. Current approaches tend to focus on the challenge itself rather than identifying that the challenge is an indication of a deeper underlying problem and addressing this. Without identifying and resolving the underlying problem(s), BI may be unable to move beyond existing challenges. In cases where it does, it may do so with more difficulty than is necessary, only to experience further challenges as a result of the underlying problem in future.

This part of the literature study chapter identifies characteristics of BI's worldview in an effort to understand BI at a deeper level, as a first step to understand and address BI challenges. The chapters that follow examine the worldview characteristics to determine what can be improved or shifted to enable BI to consistently achieve expected results.

2. "Worldview" in context

Chapter 1 briefly introduced the worldview as a view of reality that affects behaviour (Heylighen, 2000), held by an individual or collectively by a group. Further definitions are:

> *A set of images (structures or schemas) and assumptions about the world (Kearney, 1984:10; 47).*

> *"A conceptual framework through which perceptions are screened" (Meehan, 1968:41).*

Examining the "worldview" concept in a bit more detail than provided in Chapter 1, it is apparent that it dates back to the 1700s to Immanuel Kant, in a long and fascinating history (Vidal, 2008:2). The concept has been used across disciplines such as philosophy, theology, anthropology, education, humanities and the social sciences (Vidal, 2008:2; Grunig and White, 2010:33). Within IS, an example of where "worldview" has been used is in Soft Systems Methodology (SSM). SSM uses a notion of a worldview to analyse the "people" dimension of a problem situation within managerial, organisational and policy contexts (Lester, 2008). IS research paradigms such as interpre-

tivism or positivism, for example, are also considered worldviews. G-D and S-D Logic are also considered to be lenses, perspectives or worldviews (Vargo, 2011b:4).

Worldview may also be referred to as a philosophy of life, mindset, outlook or ideology as it addresses questions on reality, beliefs and models of the past, future, purpose, values, actions and knowledge (Vidal, 2008:3-4; Funk, 2001). Grunig and White (1992:33) explain that, in terms of the social sciences, worldview refers to "macro thought", the large abstract structures of knowledge that people use to organise what they know and to make sense of new information that comes to them. Vidal (2008:4-6) provides such a structure, reflecting the various elements of the structure as philosophical questions grounded in research by Leo Apostel and Jan van der Veken (1991) and Heylighen (2000). A condensed version of this is reflected in Table 4, updated with insights from Funk (2001).

Table 4: Worldview framework (Based on Apostel and van der Veken, 1991; Heylighen, 2000; Vidal, 2008:4-6; Funk, 2001)

Element	Questions	Description
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.
Explanation	Where does it all come from? Why is the world the way it is?	Model of the past. Explanation of how and why phenomena arose.
Prediction	Where are we going?	Model of the future – although always with uncertainties.
Axiology	What is good/evil? What is right/wrong? What should we strive for? What is the meaning of life?	Theory of values. Provides direction, purpose, goals to guide actions, measure of value.
Praxeology	How should we act? What should guide us?	Theory of actions. General principles according to which actions should be organised.
Epistemology	What is true/false? How is knowledge obtained? What are the limitations?	Theory of knowledge. Source of knowledge.

Scott M. Peck, author and psychologist, contextualises the concept of a worldview eloquently in his explanation that "our view of reality is like a map with which to negotiate the terrain of life". He explains that we are not born with maps, but have to make them – and that this is not our greatest challenge, rather our greatest challenge is continuously redefining them to become larger and more accurate (Peck, 1978:32-33). In the same way, there are worldviews of business, economy, IT, ISs – and even BI. A "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 of the individual, BI's map is constantly revised, redefined and shaped by its environment. Positivists believe that these maps are true representations of reality that can be verified by objective observation. How-

ever, as indicated in the interpretive paradigm, philosophers of science are now aware that scientists are human and subjective and that subjectivity plays a role in building worldviews. Today philosophers describe the worldview as a mindset that focuses the attention on observations that fit within that mindset (Grunig and White, 2010:34).

Furthermore, philosophers (Kearney, 1984:4, 53) explain that there is a correlation between worldview, values and behaviour. Funk (2001) explains that a worldview can at least be partially inferred from behaviour. He shows how individuals sense, think and act (and thereby cause responses) in reaction to stimuli (e.g. internal and external environment), intuition, revelation (e.g. sense of higher knowledge, possibly in a spiritual sense) and knowledge formulated in a worldview. An adaptation of this is reflected in Figure 7. Funk's original diagram includes the world/universe, the self, other selves and does not show Figure 7's text in brackets and italics or the link between worldview and "think" as bidirectional. In Funk's diagram this arrow flows in one direction only, from worldview to "think".

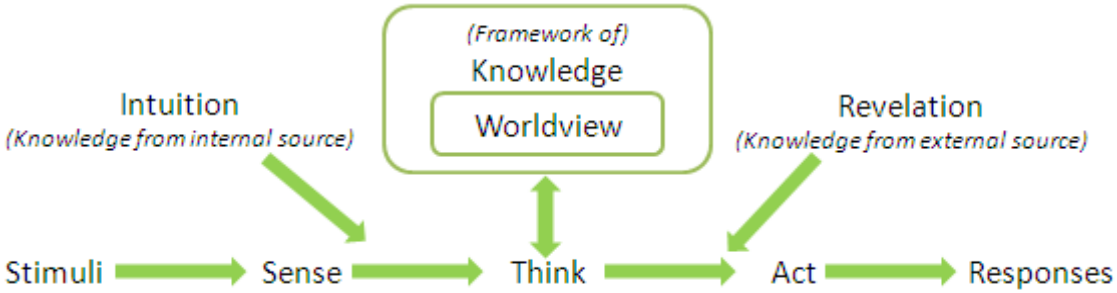

Figure 7: Worldview in context (adapted from Funk, 2001)

Returning to the focus of this thesis, namely, providing novel perspectives that could highlight alternative approaches to address BI's persistent challenges, Figure 7 assists by reflecting the relationship between the worldview, the actions that result from a particular worldview and the outcome or responses that result from the actions. This is reflected in Figure 8.

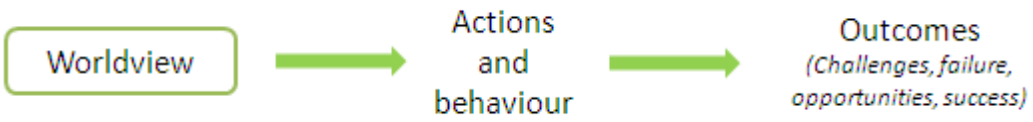

Figure 8: Worldview in context of understanding challenges (adapted from Funk, 2001)

By analysing the available literature, the researcher identifies that there is a dominant worldview that is held of BI. This is now described. The actions and behaviour that can be seen to typically stem from this worldview are then discussed, in context of BI's challenges.

3. Method to determine BI's worldview

Characteristics of the worldview that are commonly held of BI are not explicit. However, they can be inferred in terms of the elements of the framework reflected in Table 4 above and used to identify a common or dominant worldview. To do this, BI participants' and observers' voices are examined in terms of this framework's elements to ascertain how BI is perceived, its values, its sources of knowledge, etc. This is performed in this chapter using the literature as a base and then, in the case study chapter using Fortune Bank and its potential BI vendors as a base. Literature from academic and practitioner sources has been collected and analysed for this purpose.

First, the elements of BI's worldview are identified and then the worldview of BI is described using the findings identified in each element. The first element – BI's model of reality – requires analysis of the literature for the perceptions or realities of BI to emerge. As this analysis is fairly lengthy, involving much literature, it is presented as its own section (section 5).

4. Elements of BI's worldview

4.1 BI's model of reality as a whole (Ontology)

BI's model of reality concerns itself with how BI is perceived. Unfortunately, based on the fact that there is no single, universally accepted definition or context for BI, it can be determined that there is not a unified perception of BI either. Examining the literature on BI's definitions and context, it can be seen that BI is a concept that is open to interpretation and, as such, is a concept of multiple and varying interpretations.

BI is heavily defined in the literature: bookshelves, journals and the Internet are saturated with books, articles, advertisements and even blogs on BI (Miller, 2000:121; Andersson *et al.*, 2008:12; Biere, 2003:7; Tabatabaei, 2009:16). Yet, despite this, there is no universal explanation of or consensus on precisely what BI is, where precisely it fits and what is included in and excluded from its scope. BI means many things to many people (Frolick, 2006:101). Its application in practice also varies from organisation to organisation (Lönnqvist and Pirttimäki, 2006:33). It is a concept that remains generally ambiguous, confusing and open to interpretation (Arnott and Pervan, 2005:71; Ackerman, 2005:43; Fuld, 1995:2 4; Gilad 1996:4; Olssen and Sandell, 2008:29; Pirttimäki, 2007b:2; Sabanovic, 2008: 8-9). Defining what BI is causes substantial debate among practitioners and academics (Wright and Calof, 2006:453).

This highlights that BI's reality is subjective and open to interpretation. It can, however, be contextualised by understanding of the various realities (perceptions) that are held about it. As stated above, analysis of these perceptions and beliefs can be found in section 5. Significant findings can be made from this analysis that feed into the understanding of what is inadequate and can be

improved in BI's worldview where such things ultimately result in BI's challenges.

4.2 BI's model of the past (Explanation)

Looking to the past to ascertain why BI's model of reality is so unsteady reveals no definitive explanation, only some examples of behaviour and actions that have contributed to the ambiguity in BI's understanding. One such example is that, as a result of the hype created around BI during the 1990s, BI became something of a "buzzword" (Ackerman, 2005:20; Pirttimäki, 2007b:4; Williams and Williams, 2007:5). This contributed towards clouding the understanding of BI as, due to the hype, there was an inflated demand for BI and opportunists began marketing non-BI or distantly related solutions as BI solutions, just to increase sales opportunities. This resulted in confusion on what BI solutions actually are. Another example of a reason why BI is ambiguous is that numerous ISs are used in conjunction with and in context of BI (Vitt *et al*., 2002:24), with BI often embedded in the organisation's processes and ISs (Campbell, 2009). As a result, BI is frequently confused with IT systems and processes (Sharma and Djiaw, 2011:114)) and it may be difficult to see where the IS starts and where BI ends. An example of this is of Customer Relationship Management (CRM) systems, where one organisation may consider this to be a BI solution, while another considers CRM strictly in its own domain (Payne and Frow, 2005:167).

Taking a step back and examining what BI aims to address, however, reveals that BI – and similarly positioned solutions – do not aim to address anything new. They aim to address the age-old managerial requirement whereby information or intelligence is needed for decision-making (Pirttimäki, 2007:iv). BI's history shows that many solutions have emerged over the years to address the requirement for intelligence for decision-making. Part 1 of this chapter discusses BI's purpose in the context of the historical need for information for decision-making in detail – from Sun Tzu's need for intelligence, to Luhn's 1958 BI system, to the emergence of the various solutions used for this requirement – DSSs, EISs, ESs, etc. What emerges is that BI is a type of IS (although it has many unique characteristics and is not only an IS), that emerged in response to the need for decision-making support (de Grauw, 2011). As such, BI is multi-disciplinary in nature, extending to the traditional disciplines and fields of research such as philosophy, information science, business economics, strategic management, management accounting and Human Resources (HR) management (Pirttimäki, 2007:36).

Grounded in this history, although multi-disciplinary in nature, BI appears to have its roots (at least its deepest roots) in a hard (mechanistic, deterministic) systems and engineering background.

4.3 BI's model of the future (Prediction)

Understanding the vision for BI's future helps to understand the current dominant worldview of BI. This is because it facilitates understanding of dominant forces driving BI today. What emerges

clearly in both practitioner and academic literature is the dominant focus on technology. Even predictions about organisations focus on technology vendor merger and acquisitions that are anticipated (Imhoff, 2006; Katta, 2010; Pendse, 2009). Initially this started with the so-called mega-vendors acquiring the smaller vendors to deepen their BI offering with a particular specialisation. The wave then peaked when so-called BI giants Business Objects, Cognos and Hyperion were acquired by software titans from outside the BI industry: SAP, IBM, Oracle and Microsoft (Pendse, 2009; info-Tech Research Group, 2010:3).

Growth in demand for BI specialists and knowledge workers is expected to rise due to technological capability to generate big data and the corresponding need to analyse this (McKinsey, 2011). Operational users now require faster response times and granular levels of data (Shahzad, 2010). De Grauw (2011) indicates that BI has been pushed by technology since the early 1990s and predicts that the next wave of BI will see big data (enabled by technology) pushing BI.

BI literature on the future focuses on future BI technologies and new or emerging technologies that BI can leverage off of. Examples of the former are: BI visualisation (Imhoff, 2006; Campbell, 2009; Katta, 2010; Bardoliwalla, 2009); real-time data processing technologies (Imhoff, 2006; Mckinsey, 2011:2-4; Gartner, 2011; de Grauw, 2011; Hertzberg, 2010); search-based BI (de Grauw, 2011); and; predictive analytics (Campbell, 2009). There are also trends toward BI delivery facilitated by: mobile devices (e.g. a source of "location intelligence") – including tablets (Kanaracus, 2011); composite applications using different services in a SOA or cloud-computing (Dortch, 2009:1) and; social networking platforms (Campbell, 2009; Katta, 2010). User experience expectations are currently being set by Google (for speed) and Apple (for usability and design) according to Hoggarth (BI Summit, 2012).

BI is expected to be integrated into the organisation and spread out to the "masses" with the rise of these types of interconnected solutions (De Grauw, 2011; Info-Tech Research Group, 2010), BI's integration into existing technologies already used by end users (e.g. iPads and applications such as Excel and PowerPoint – Hoggarth and Stacey (BI Summit, 2012)) and the rise of self-service BI products (Kanaracus, 2011). Integration with sales, service and support through "feeders" such as CRM, the organisation's internal telephony and security applications and Enterprise Resource Planning (ERP) applications through "Web 2.0 style" technical collaboration is also expected (Dortch, 2009:1-2; Bardoliwalla, 2009) and "BI 2.0" involving collective intelligence of the user community to enrich existing information (Cooper, 2010).

The introduction of social networking platforms to the BI environment is significant as, not only will more data be gathered (e.g. decision trails, data on relationships, profiles, etc.), but more of a focus is expected on collaboration and decision-making. In fact, it is forecast that decision-making is expected to return as the central focus of BI offerings (Bardoliwalla, 2009). Bormann (2007) identifies organisations' requirement for client-consultant relationships that extend beyond delivery of

the BI project, assisting decision-makers to use BI solutions. However, there is little further literature that supports this. Instead, analytics – as an IT solution – is seen as the means to achieve the refocus on decision-making (Gartner, 2011). In fact, "analytics" is seen to be the term to replace BI (Henschen, 2010). It is described as "the new path to value" as organisations rush to capitalise on "increased information richness and analytics to gain competitive advantage" (LaValle *et al.,* 2010:2).

4.4 BI's values (Axiology)

Axiology highlights the relationship between value and purpose. It relates to how to judge, evaluate and recognise value which, in turn, is decided by purpose (Lee, 2011). Identifying the axiology in the literature on BI assists to understand BI's valuing systems. Valuing systems influence BI's perceptions and decisions and can be used to explain the actions resulting in BI's challenges (Hartman, 2011). BI's values, which give it direction, purpose and provide a set of goals to guide actions (Vidal, 2008:4-6) can be seen in the purpose of BI and the benefits that are described for BI. It can also be seen where BI invests time and money – and where it neglects to do so. Currently there is heavy investment in BI IT solutions (Ackerman, 2005:1, 26; Calof and Wright, 2008:718; Coulonval *et al.,* 2010:3) and a focus on BI asset creation, with a neglect of focus on the use of BI (Oracle, 2010:3; Buder and Feldon, 2009:1). BI asset creation encompasses all the activities involved in building, deploying and maintaining a BI environment and applications (Williams and Williams, 2003:14).

BI's purpose, as discussed in the previous chapter, is raised consistently as the enablement and support of decision-making (Hočevar and Jaklič, 2010:95). This relates to an effect of using a BI solution, much like other purposes which are raised in the literature such as improved public relations or innovation. BI purposes are also raised on the characteristics of the BI solution itself (e.g. agility, responsiveness, performance). Pirttimäki *et al.* (2006:83-90) identify that a BI user may perceive value in ease of use of BI tools while, at an organisational level, value is based on benefits realised as a result of the intelligence available. This highlights the subjective nature of BI value. BI's value is constrained by time, relevance and ability to react and also by decision-maker, source and format.

Miller (2000) identifies that the point where information has been driven to a decision is where the value of intelligence lies. However, information driven to a decision point is, like many of BI's purposes and benefits, intangible (Andersson *et al.,* 2008:30). This is not valuable unless it is converted into business value, e.g. the Net Present Value (NPV) of the after-tax cash flows generated by or associated with an investment (Williams and Williams, 2003:12-13). It is relatively simple to calculate the cost of a BI investment by calculating the costs involved in purchasing a BI solution, training staff, running projects, etc. However, calculation of the ROI on BI is difficult to measure as it requires a quantitative value for "benefit" (Krigsman, 2010; Vandergriff, 2008:433; Vanmare,

2006:I; Lönnqvist and Pirttimäki, 2006:33; Pirttimäki, 2007:107). This may be as a result of BI initiatives stopping after creating a BI asset, rather than extending beyond BI solution rollout to capture value after implementation of the BI solution (Williams and Williams, 2003:14). It may also be as a result of the intangible nature of the benefits that are promoted. Pirttimäki (2007:107) speculates that a supporting measurement culture may not exist, measurement is dificult as BI is carried out in several ways or that BI measurement is overlooked because of complexity and cost concerns – giving the example that it is difficult to assess effects of a separate activity or an IS on the organisation's profit.

4.5 BI's guiding principles (Praxeology)

Practitioner literature reflecting content on how BI is guided is typified by the provision of rules (e.g. CSFs/best practices), methodologies (e.g. BI lifecycle) and techniques or tools (e.g. Accenture's BI and IM diagnostic tool). Based on what is said in practitioner literature, BI success can be achieved by applying the rules or tools, in almost a formulaic manner. In a similar way as with the literature on BI's challenges and CSFs, academic literature on BI's guiding principles tends to focus on specific elements to guide BI, rather than on the lists of practices that the practitioner literature tends to provide. Only academic literature provides a body of knowledge on philosophical underpinnings to guide BI. Examples of this are provided in the last point in Table 5.

Table 5: Summary of what guides BI

BI guide and Description and examples from literature
1. BI strategy or roadmap: This may refer to a long-term vision whereby BI objectives are aligned with technology and data structures (La Grouw, 2011). It may also refer to BI project lifecycles, which are of a shorter term (Atre, 2003). Either way, it offers insight into the BI environment by specifying what is to be built, how it is to be built and when it will be ready to meet user requirements (La Grouw, 2011).
2. Critical Success Factors (CSFs) (and best practices): As reflected in the previous chapter, practitioner literature tends to provide lists of "top ten" CSFs while academic literature focuses on specific aspects of the BI process or environment that can make BI successful. Academic literature also expands on CSFs by combining them in multi-faceted solutions (Wixom and Watson, 2001:19; Nandhakumar, 1996; Bussen and Myers, 1997). A list of CSFs can be found in the literature study chapter on BI challenges. The literature's best practices appear to be interchangeable with CSFs.
3. BI scorecard: BI scorecard is used in two contexts. La Grouw (2011) defines it as a tool to measure BI's maturity and development, tracking BI and data warehouse deployment according to BI best practices. MicroStrategy (2011) defines the BI scorecard as a tool that is provided by BI for managers and executives to get an overall view of business performance.
4. BI MM: The BI MM is used to measure and justify investment in BI systems. They define, ex-

BI guide and Description and examples from literature
plain and evaluate growth lifecycles (Rajterič, 2010:47). BI may use its own maturity models, e.g. the business intelligence development model (BIDM), Hewlett Package Business Intelligence Maturity Model, Business Information Maturity Model. Or it may draw from maturity models used in other other areas like Software Development, Knowledge Management, Performance Management and Data Management which are still general enough so that they can be modified for the BI domain (Chuah and Wong, 2011:3424, 3427; Rajterič, 2010:49).
5. BI readiness assessment: Determines where the organisation is currently in terms of BI and the steps it needs to take to get to where it would like to be. Readiness assessments typically involve assessments of current information (including information timeliness), BI capability, BI applications and business need for BI (La Grouw, 2011). Accenture (2008) uses a BI and Information Management (IM) diagnostic tool to identify the BI readiness in an organisation's BI. This tool applies to key areas – governance, delivery, data, storage, strategy and security.
6. BI lifecycle: While the strategy or roadmap specifies the what, how and when, the lifecycle reflects a generic cycle that individual BI efforts and initiatives will follow. It is described as a roadmap to guide BI's activities from collection (infancy) to reporting (childhood) to analytics (adulthood) to visualisation (maturity) (La Grouw, 2011).
7. Governance, standards and compliance: The BI environment forms part of the organisation. Both are regulated and governed by various legislative, organisational and industry policies, standards, procedures and strategies. These apply to areas such as: data and the handing of information, IT systems, IT services, finance, etc. Examples of these are: the organisation's data governance strategy; South Africa's Protection of Personal Information Act (POPIA); the IT Information Leadership (ITIL) Service Management framework; the Control Objectives for Information and Related Technology (COBIT) framework; BI frameworks; etc. Frameworks typically consist of managerial/technical guidelines for BI.
8. Organisational models: The Business Intelligence Competence Centre (BICC) provides another guide for BI actions. The BICC organises all aspects of BI in a model to achieve BI competency (HP, 2009:15).
9. Philosophy or theory: Academic literature is available on philosophy or theory that guides BI's actions. Examples are from: Papadopoulous and Kanellis (2010:25) who suggest Actor-Network Theory to guide BI; various epistemologists who have begun to apply their work to IM (e.g. Suppe, 1985; Floridi, 1996; Goldman, 1999:161–217; Fuller, 2002; Fallis, 2004); and Gao (2006) who uses Activity Theory to better identify dimensions for data warehouses; amongst others.

4.6 Source of knowledge on BI (Epistemology)

BI's explanation or history reflects that it is multi-disciplinary in nature. It is informed by theoretical concepts and methods from one or more disciplines, sciences, activities and fields of research. Examples of these include: philosophy, information science, business economics, strategic man-

agement, management accounting, military science, marketing, ISs and Human Resources (HR) management (Pirttimäki, 2007:36, 90, 92).

The assumption should then be made that BI knowledge stems from multiple disciples and that BI and BI practitioners are well informed and well-rounded in these disciplines as a result. However, BI literature reveals that this is not the case. Challenges are raised on the shortage of BI experts with skills in IT and business (Davenport, 2006:7) – before even considering the rest of the conglomeration of disciplines, sciences and functions that BI stems from – and on the gap between BI, IT and the business (Cooter, 2009). In addition, the technical nature of BI's challenges (as described in the previous chapter) and the evidence of the domination of IT in BI's solutions, and in its values and guides (shown in sections 4.4 and 4.5 above), highlight this as a limitation or imbalance in BI's knowledge and possibly indicate that this emphasis is the reason for the imbalance.

5. Contextualising BI's perceptions

As discussed in section 4.1 on BI's ontology, the researcher analysed available definitions of BI to gauge participants' and observers' perceptions of reality in terms of BI. She based this analysis on examples of similar analysis that has been performed previously. She did this to build on existing insights and to identify a feasible approach grounded in existing research. She also aimed to use methods and categories of comparison that are already accessible and potentially familiar to others. This is discussed next, followed by a summary of her approach and then a discussion of the main four perceptions of BI that emerged consistently in the researcher's analysis.

5.1 Related analysis available in the literature used as a foundation

Research from Ackerman (2005) and Pirttimäki (2007a; 2007b) reflect the most comprehensive analysis of BI definitions and context that the researcher has found in available literature that is relevant to this thesis. Further analysis that has also been used is from Payne and Frow (2005:168, 174-175), Herschel (2010b) and Glancy and Yadav (2011:49) as well as a suggestion from Kaisler (2012).

5.1.1 Conceptual analysis of BI context and definitions from Ackerman (2005)

Ackerman (2005:20) classifies groups of authors in a framework, highlighting the difference in the ways these groups define BI. His framework places BI in context within the business environment while drawing from what he describes to be the settled and established intelligence profession, including academic and practitioner literature on the intelligence profession and BI. Ackerman promotes the intelligence profession's emphasis of the importance of an intelligence process that results in actionable outcomes, indirectly criticising the business world's lack of a concrete BI definition in comparison, calling for a common BI definition in business. He focuses considerably on

the difference between authors who define BI including or excluding external data, which is irrelevant in today's BI literature where it appears to be unthinkable not to include both sources. Furthermore, he does not expand on the definitions of BI, contextualise concepts that are often perceived to be the same or related to BI – e.g. MIS, DSS, the various types of intelligence (product, customer, etc.) – or examine the consequences or behaviour resulting from the current contextualisation of BI.

His research, however, still provides useful insights that are used in this thesis. He identifies that confusion has been created by authors who fail to define BI comprehensively. He also reveals that there are numerous authors who define BI according to the practical benefits or outcomes they can achieve by implementing a BI technology solution. Another insight is that he identifies that there is a dominant technology focus, but that there are also process and product perceptions of BI. The researcher used these perceptions as potential categories when she started her analysis.

5.1.2 Conceptual analysis of BI context and definitions from Pirttimäki (2007a; 2007b)

Pirttimäki (2007b:10-12) contrasts Ackerman's call for a common BI definition: she identifies that, due to each organisation's unique and situational nature, BI should be viewed as a multi-dimensional concept within the organisation's specific context. She maintains that this is aligned with other information-intensive managerial activities, such as management accounting, knowledge management, strategic management, etc. (Pirttimäki, 2007a:84-91). She discusses, compares and positions these activities with BI, along with the concepts that are or may be related to BI (e.g. the various types of intelligence, market research, etc.). Her work on BI definitions incorporates dimensions of BI such as: internal/external; detailed/broad; integrated/specific; and past/future. She categorises BI definitions according these dimensions, placing them in context according to strategic, tactical and operational levels.

In a similar way to Ackerman's (2005) reference to the intelligence profession, Pirttimäki refers to MI. She states that the phases of the BI process are similar to the intelligence procedure used in the context of military activities (Endrulat, 2003:8). However, she also states that BI's roots stretch not only to military science, but also to information science and business economics (Pirttimäki, 2007a:90). The researcher therefore bases her exclusion of MI from the scope of this thesis on this – the scope of this thesis is not sufficiently broad to include military science, information science and business economics. Instead, the researcher focuses on how BI is perceived and experienced within practice in the business organisation.

Although very broad, Pirttimäki's work provides useful insights. The first major insight is that the perception of BI is subjective. Secondly, her work determines that the content of BI definitions, albeit ambiguous, has not changed significantly from the 1980s to present day, aside from technology which is new. Another useful insight is the "main areas" or viewpoints that Pirttimäki identi-

fies. She identifies five typical viewpoints of BI, namely: philosophy; technology; managerial tool; process; and refined form of information.

These are useful insights which the researcher has used as input to her analysis and categorisation of BI definitions, with minor adjustments. However, Pirttimäki unfortunately does not discuss or justify these viewpoints in significant detail in her journal article (Pirttimäki, 2007b:1-11) and loses the substance of this discussion amongst other discussions in her thesis (Pirttimäki, 2007a:93). Furthermore, Pirttimäki (*ibid*) neglects to explain her "philosophy" viewpoint, only describing it briefly as "methods and ways of thinking in the BI context". The researcher discontinued her use of "philosophy" based on this and on the fact that she did not find significant BI definitions that contribute to the perception that BI is a philosophy in available literature.

5.1.3 Conceptual analysis of BI context and definitions from further authors

Payne and Frow (2005:168, 174-175) perform analysis of CRM definitions that is similar to the researcher's analysis. They conclude that potential opportunities available through CRM are restricted by its prevailing focus on technology; a useful insight for this thesis. They analyse 12 CRM definitions from "various sources" (presumably, based on their references, academic and practitioner literature sources).

In contrast, Herschel (2010b) and Glancy and Yadav (2011:49) provide less in-depth analysis of BI definitions. Although Herschel (*ibid*) contends that there are too many inconsistent BI definitions and an unproductive focus on technology components and capabilities, he does not provide significant analysis of this. The focus of his article is a plea for a common, productive definition of BI which he then proposes himself – concentrating this on the result of BI rather than the technology components or capabilities that may be involved in achieving this. Glancy and Yadav (*ibid*) follow suit, contending that a commonly accepted definition of BI or of a BI system does not exist and that BI has very little theoretical foundation. They highlight that previous work concentrates narrowly on subsets of BI systems, tools and business functional areas. Although it is useful in the context of this thesis that they identify the need for a wider or more conceptual approach to the definition of BI, Glancy and Yadav (*ibid*) do not analyse or provide critique on existing definitions or context. They only propose a conceptual model for BI to develop, assess and evaluate BI systems, develop new BI systems, direct research and assist practitioners to understand the potential of a BI process.

Finally, Kaisler (2012) suggests that BI's definitions can be examined semantically and syntactically. Semantics are concerned with prior knowledge or commonly established knowledge as a basis of understanding (Fryer, 1996), while syntax refers to a rule-based grammatical system (Fieback and Planck, 2003:170). Kaisler uses this in the context of BI, explaining that there may be people who define and think of BI in terms of organisational processes and rules (syntactic)

versus people who define and think of BI in terms of the organisation's environment and context (extending to that of the customer of the organisation) (semantic). He provides the example of WalMart where, to be successful, a branch manager must have knowledge and understanding of the local community and environment in which the branch operates (semantic knowledge). This knowledge is used in conjunction with BI generated by WalMart on its processes (syntactic knowledge). In this example, syntactic knowledge may include information that is internal and external to the organisation. Kaisler's view is therefore broader than merely stating BI should include internal and external sources of information. He specifically draws attention to the importance of knowledge of the customer in terms of the environment and context of that customer.

Although this provides a useful dimension for analysis, the researcher does not apply this to the literature's BI definitions. She believes that, although the definitions provide adequate insight on the perception that is held of BI, they do not yield sufficient insight to accurately gauge whether they take the knowledge of the customer in terms of the environment and customer's context into account. She includes Kaisler's suggestion, however, in the case study, where this deeper level of insight is possible.

5.2 Method to perform analysis

Like Payne and Frow (2005), the researcher collated BI definitions from various academic and practitioner sources. She selected 70 definitions for analysis, spanning the period 1986 to 2012, based on the definition's relevance and the source's academic or professional credibility. She specifically excluded definitions focused solely on what she believes are BI-related terms (e.g. MIS, IM, analytics, etc.), instead, focusing only on those positioned as BI definitions. She did observe, however, that significant differences between BI and BI-related definitions only become apparent at a more detailed level (e.g. where the scope, audience, etc. are discussed in the definition) and do not consistently reflect at a conceptual level.

The researcher then analysed existing research on BI definitions (discussed above in 5.1) and formulated lists of possible categories for analysis, keeping her objective to ultimately provide novel perspectives to overcome BI's challenges in mind. She simultaneously started analysing her list of BI definitions to identify possible patterns or inconsistencies in the way BI is defined. Based on this, she identified that she could categorise definitions according to whether they reflect one or more these perceptions: technology, process, product or capability. Patterns emerged in the BI definitions reflecting a tendency for BI to be defined from one or a combination of these perceptions. At the same time, these perceptions emerged in the body of academic writing from the authors referenced in Section 5.1 above (excluding Kaisler (2012)). Herschel's work reflected the technical and capability perception, while Glancy and Yadav's and Payne and Frow's (2005) reflected just the technical perception. The work from Ackerman (2005) and Pirttimäki (2007a; 2007b) reflected all four viewpoints. While categories "product" and "capability" do not appear ver-

batim in Pirttimäki's (2007a:93) list of viewpoints, the researcher believes that Pirttimäki's viewpoints "refined form of information" and "managerial tool" are reflective of product and capability perspectives respectively.

It is recognised that, just as there are many different definitions and perceptions of BI, there are also many ways to categorise these perceptions. The researcher's list of BI perceptions is therefore just one subjective view of reality, based on that of the researcher and of the authors whose definitions and discourse were analysed. As reflected above, Pirttimäki's (2007a:84-91) research identifies additional dimensions for analysis that could be applied, e.g. internal/external, detailed/broad, past/future, etc. and there are likely to be further dimensions that emerge in the future or that the researcher is unaware of. The researcher, however, discovered that she was able to perform sufficient analysis based on the perceptions she identified and that analysis through the additional dimensions that had emerged at this stage did not provide significant insights relevant to this thesis' research questions, nor did they counter or invalidate the researcher's findings.

This presents a method grounded in the interpretivist paradigm as the researcher performed a qualitative analysis of BI definitions representing voices of BI practitioners (vendors, research houses, consultancies, etc.) and BI academics. Although she identifies that more support for certain perceptions emerges in the literature, the aim is not to perform a quantitative analysis and the researcher does not represent findings in terms of percentages or exact quantities.

5.3 Perceptions identified through BI definitions

The four main perceptions that guide BI that emerged as a result of analysis of the definitions of BI in the available literature are that BI is a: technology, product, capability or process. A fifth perception that emerged is that BI is understood as an organisation or department (Kent, 1966:vii). This perception is not explored further for a few main reasons. Firstly, available literature on BI does not point towards a significant movement towards defining BI as an organisation or department. Secondly, although it is recognised that one may refer to the BI department or the people working therein as "BI", for example, the same can be said about Finance, Marketing, Sales, etc. Doing this does not change the essence of the context of BI. No significant impact results from referring to the people performing the process, using the technology or assisting to create the output with the same term as that which they are performing/using/creating. Finally, a department – e.g. Sales – may have the connotation of "those who are skilled in and able to perform a sales function". Using this logic, the understanding of BI as a department therefore can be likened with the perception that BI is a capability. The four main perceptions of BI that emerged are now discussed.

While it was expected that vendors would demonstrate a different perception to academic authors, there is no significant observable difference. However, a distinction can be made between authors

who call for consolidation of the various perceptions (e.g. Ackerman, 2005:15-20; Herschel, 2010b) and those who hold that, while many contexts lead to ambiguity, a perception of BI is context and organisation dependent (e.g. Pirttimäki, 2007b:10-12). The researcher's view aligns with Pirttimäki's: each perception of BI contains an element of truth.

5.3.1 The perception that BI is a technology

A dominant perception in the literature is that BI is a technology. Many BI definitions speak only to software or technology components (English, 2005) or reflect a strong focus on technology as an enabler (Pirttimäki, 2007b:11; Sharma and Djiaw, 2011:116). Reviewing today's literature – both academic and practitioner – it is clear that there is an overwhelming number of BI definitions that reference technology directly, indirectly, define BI as a technology or define BI in terms of the practical benefits that can be obtained when implementing a BI IT solution (Ackerman, 2005:21). A review of definitions on the Internet leaves an impression that BI is all about technology (Herschel, 2010b). Some technology-focused BI definitions emphasise the technology component of BI to such an extent that it would seem unthinkable to have BI without IT, leaving one with the impression that BI cannot be practiced without technology (Ackerman, 2005:22).

A few of the BI definitions are now specifically highlighted as examples that demonstrate the technical perception of BI. Consider the following examples of definitions; these reflect instances where BI is defined purely from a technological perception:

> *"A common noun for technical applications, software and tools that enable more effective information processing" Raisinghani (2004:x).*
>
> *A group of applications that enables active and passive delivery of information (Kalakota and Robinson, 2001:161).*
>
> *A broad category of computer software solutions enabling the organisation to gain insight into its critical operations (Information Builders, 2008).*

Still further authors (e.g. IBM, 2008; Microsoft, 2008; Davenport and Harris, 2007:6:7; Papadopoulos and Kanellis, 2010:16) provide BI definitions that highlight the technology perception through a focus on technology components such as software applications, data management activities, data warehousing and decision support. From the technology perception, BI is seen to consist only of the layers of technology (data, analytics, access/presentation, etc.) and is typically governed and guided by technology methods, processes and policies. Technologies may include, for example, Online Analytical Processing (OLAP) and Relational Databases, Extract Transform Load (ETL) tools, front-end applications, report generators, etc. Examples of further authors using these or similar terms in their BI definitions are: Andersson, Fries, Johansson (2008:3); Du Plessis

(2006:23); Eckerson (2003:1); Gilad and Gilad, (1986:65-70); Gao (2006:11); Harris (1999); Herschel (2010b); Loshin (2003:6); Ranjan (2008: 461); Tustin, Venter (2007:1); Vanmare (2006: i) and; Vitt *et al.*, (2002:13-22).

In contrast with the view that BI is a technology, Filenet (2008) (a BI vendor) advocates that, although BI is often defined by the practices and technologies that enable it, it is more than a technology. Filenet states that BI requires new processes, resources and competencies. Aligned with this, Williams and Williams (2007:2) clearly state that BI is not a technology, or even a single product – they state that BI is the combination of products, technologies and methods. Similarly, there are other authors who recognise the technology focus and describe it to be problematic (English, 2005). Payne and Frow (2005:168) perform analysis of CRM definitions and, relevant to this discussion, find a similar dominant focus on technology, identifying this as a "limited technology perspective". Sharma and Djiaw (2011:116) highlight that while many BI initiatives focus on technology as an enabler, not all BI initiatives actually require implementation of IT to make them successful (Davenport and Prusak, 1998; O'Dell and Grayson, 1998). In fact, BI is considered to be broader than the tools or the limited scope of current BI systems (Glancy and Yadav, 2011:49).

An observation about the authors who define BI as a technology is that this group consists mostly BI vendors, although not all BI vendors can be categorised in this group and some even advocate that BI is more than a technology (e.g. Filenet, 2008). Some research houses and consultancies are also included in this group (e.g. Accenture (2008), Gartner Group and META Group (Ackerman, 2005:22)), as well as academic writers (e.g. Georgia State University Business School (2012), Raisinghani, 2004:x, Davenport and Harris, 2007:6:7 and Kalakota and Robinson, 2001:161). Gladwell (2009) identifies the shortcoming that today's vendors generally think of BI from an engineering-centric worldview, focused primarily on technology rather than on people.

Ackerman (2005:21-22), who provides a study of how authors define BI, identifies technology as a major category into which the literature's BI definitions fit. He states that many BI vendors (giving examples of IBM, Microsoft and Decisions from Data) circumvent defining BI by merely listing the technology benefits. In addition, examining the BI literature available from Microsoft as another example, one can see their tendency to define BI in terms of their product range (Olssen and Sandell, 2008:26). Many vendors go so far as to distort the view of BI to include their specific technology products, which may only be indirectly related to BI – with the intent to increase sales while BI enjoys heightened investment and prioritisation (E-Solutions Integrator Inc. (ESI), 2010; Haasbroek 2012; Joubert, 2012).

BI vendors' fervent promotion and marketing of their technology products – released at a rampant pace in a competitive market – may be a catalyst for the overwhelming technology focus that is evident in the literature. Another factor contributing to the technology focus may be that organisations now have more data than ever before (Himmelsbach, 2005:12; Murphy, 2005:2) which they

need to extract, process and analyse with sophisticated technology in the interest of time and accuracy. Paradoxically, organisations may overestimate their requirement to process high volumes of data as a result of the technological capability to do this (Accenture, 2008; Willcocks and Whitely, 2009:191). Another factor may be that the technology focus is a result of the pressure exerted by management in an attempt to remain competitive by implementing the latest BI solutions. Another paradox is that management may, in turn, be influenced by the BI vendors' product promotion, which is frequently aimed at the higher echelons of the organisation where the buying power is seated. However, irrespective of the reasons for its origin or existence, the technology perception clearly demonstrates its existence, with sufficient literature support.

5.3.2 The perception that BI is a process

Another perception that clearly demonstrates literary support for its existence is of BI as a process. Much like the perception that BI is a technology, the support for the perception that BI is a process is overwhelming. This perception is supported by an abundance of definitions in the literature from academic authors, research houses and BI vendors. Unlike the technical perception, which is dominated by definitions from BI vendors, the BI process perception is dominated by definitions from academia and dominates academics' BI definitions.

Some of these definitions imply that BI is a process while others state directly that it is a process. In terms of those which imply BI is a process, these typically describe how BI performs activities or how it assists decision-makers or the organisation (e.g. from Andersson *et al.,* 2008:2; Brackett, 1999:1; Group 1 Software, 2008; Information Builders, 2008; Turban *et al*., 2007:9). Examples of definitions that refer directly to BI as a process are:

> *BI is a systematic process that gathers, analyses and classifies the flow of significant information (Thomas, 2001:48–49).*

> *BI is an organised and systematic process by which an organisation acquires, analyses and circulates information from internal and external sources relevant to its business activities and decision-making (Lönnqvist and Pirttimäki, 2006: 32).*

These definitions emphasise BI as a systematic process, however, not all definitions emphasise the "systematic" aspect of BI as a process. Others emphasise, for example, the ability of the process to assist decision-makers or the organisation (as described above) or the interactive nature of BI as a process (e.g. from Harris, 1999; Eckerson, 2003:1). There are also authors who state that BI should be defined as only a process and not as a system or product (e.g. Gao, 2006:11) and, conversely, those who define BI as a process and a product (e.g. Ackerman, 2005:38-39; Jourdan *et al*., 2007:121) or as a process and a capability (e.g. Oracle, 2007).

Analysis of definitions where BI is defined as a process reflects emphasis on the processes involved in the creation of BI in terms of activities such as gathering, processing, analysing and presenting data, information and intelligence, neglecting the use thereof. Only a few definitions refer to BI use when defining BI in this context. Examples are:

> *Use of information enabling organisations to best decide, measure, manage and optimize performance to achieve efficiency and financial benefit (Gartner, 2008).*

BI is a comprehensive concept, whereby an entire organisation is committed to use the available information systems (including business intelligence) in the most effective way to obtain quality and timely information for decision-making, thereby creating competitive advantages (Hočevar and Jaklič, 2010:92).

Bräutigam *et al. (*2006:2) also refer to the use of BI in the context of BI as a capability.

5.3.3 The perception that BI is a product

The product perception, as discussed in this thesis, refers to the perception that BI is an output or result, i.e. the goal of BI and not the means of BI (Herschel, 2010b). It therefore specifically excludes BI vendors' products (e.g. the Microsoft product) or any other technology that may be involved in the creation of a product (these fall within the technology perception). It may refer to tangible (e.g. data extracts, reports, dashboards, etc.) or intangible (e.g. knowledge, insight, intelligence, etc.) products and may even be referred to generically as "the result of a process" (du Plessis, 206:23). Other examples from the literature are:

> *BI is the type of granular information that line-of-business managers seek as they analyze sales trends, customer buying habits and other key performance metrics of an organisation (Computer World, 2008).*

> *BI consists of business information and business analyses within the context of key business processes that lead to decisions and actions and which result in improved business performance (Williams and Williams, 2007:200).*

This perception is not supported in the literature as overwhelmingly as the technology or process perceptions are supported. However, there are still sufficient definitions to establish this as one of the main perceptions of BI. Authors who define BI as a product range from BI vendors to research houses to academic writers, with the latter proliferating this category.

5.3.4 The perception that BI is a capability

BI may also be seen as an ability or capability. Consider the following definitions that use these words, implying that intelligence is something that requires a level of skill or competence to accomplish or achieve:

> *Intelligence is the capacity to act purposefully, think rationally and deal effectively with one's environment (Wechsler,1972:79).*
>
> *BI is regarded as a strategic capability for most organisations for creating, collecting, analysing and applying information and knowledge (Raber et al., 2012:4219)*
>
> *BI is the ability to access and analyze information primarily via reporting tools, ad hoc query and online analytical processing, to be used by business management and analysts (Gartner, 2008).*
>
> *BI and Information Management (IM) refer to the capability of collecting and analyzing internal and external data to generate knowledge and value for the organisation (Accenture, 2008).*

The support for BI as a capability within the available literature is less than for BI as a product and significantly less than for BI as a technology or process. In fact, where BI is defined as a capability or ability, there is a tendency to define it as a capability/ability as well as in the context of the other perceptions – technology, process and product. Authors who define BI as a capability span across research houses, academic authors and even BI vendors, with a fair spread between all of these.

6. Consolidating a worldview of BI

Based on the discussion of the individual elements of the world view and the analysis of the perceptions that feed into the BI realities, the worldview reflected in Table 6 can be consolidated.
The worldview provides a conceptual framework that will be used in upcoming chapters to reflect the current situation (with challenges), a shift (changes to the worldview) and the outcome of this shift (the desired situation – challenges overcome).

The worldview highlights a few core points about how BI is perceived and understood. It highlights BI's ambiguity and its unsteady base which it operates from. In addition, it highlights how BI is informed by many disciplines, but is biased towards seeing BI as an IT solution. This emphasises the point that, although BI's main purpose is decision-making and although it aims to focus on collaboration and interconnection in the future, technology is the driver and it is believed (according to the current worldview) that it will be the enabler too.

Table 6: Summary of a BI worldview

Element	Key findings

BI's model of reality as a whole (Ontology)	• BI operates from an ambiguous and unstable model of reality. Many perceptions of BI exist. BI may be perceived as one or a combination of these perceptions:
	  • A technology that consists of one/a combination of components such as hardware, software, databases, etc. controlled, managed and governed by technical practices and methodologies.
	  • A process that consists of activities to gather, process, analyse and distribute information, transforming data into information into intelligence.
	  • A product, output, result or outcome representing meaningful and useful information that is actionable. It may be the outcome of the BI or another process (e.g. intelligence from an employee's own personal knowledge).
	  • A capability to perform the BI process or to access and analyse information.

BI's model of the past (Explanation)	• No definitive explanation for uncertainty in BI perceptions. • BI emerged from a hard (mechanistic, deterministic) systems and engineering background for management support.
BI's model of the future (Prediction)	• Focus on technological advances. However, a return to focus on decision-making is expected – enabled by analytics. • Data (enabled by technology) is the new driver of BI. • Collaboration and interconnected solutions receive attention.
BI's values (Axiology)	• BI values the BI environment and applications (neglecting use of BI). • BI values relate to the characteristics of a BI solution (agility, performance) or to the effects of a BI solution (e.g. decision-making, innovation). • Decision-making is listed as BI's foremost purpose. • BI's purposes are largely intangible, subjective and hard to measure (ROI).
BI's guiding principles (Praxeology)	• BI is guided by various strategies, CSFs, models, frameworks, etc. • Many of these are tools or methodologies provided by BI practitioners and vendors to manage, govern and guide the BI environment and its technologies – with some provided by the growing community of design researchers contributing generic artefacts.
Source of BI knowledge (Epistemology)	• BI is informed by various disciplines, science and business functions. • A limitation is identified in the imbalance caused by the focus on BI's IT and IS aspects.

7. Understanding BI's worldview to identify novel perspectives to address BI challenges

With BI's worldview identified, as far as this subjective and fluid "reality" can be identified, the next

step is to identify the challenges that result from this. Figure 9 reflects the relationship between the worldview elements, as interpreted by the researcher, based on the worldview literature referenced in this part of the literature study (Apostel and van der Veken, 1991; Heylighen, 2000; Vidal, 2008:4-6; Funk, 2001). It shows how the understanding of what is (ontology) results in specific values (axiology) and actions driven by guiding principles (praxeology) and how these are influenced by the underlying source of knowledge (epistemology), the past and the future.

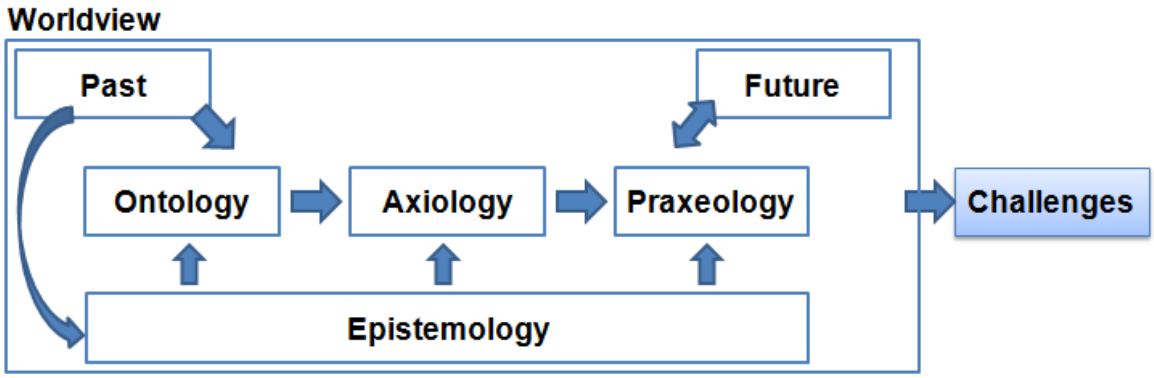

Figure 9: Relationship between worldview elements and challenges (Based on Apostel and van der Veken, 1991; Heylighen, 2000; Vidal, 2008:4-6; Funk, 2001)

A few examples are now provided in Table 7. The aim is to reflect a few examples, rather than an exhaustive list, a more detailed list, reflecting the literature and case study findings in this regard, in Appendix I. Table 7 reflects challenge categories as coded in Part 1 of this chapter.

Table 7: Examples of BI worldview actions and behaviour resulting in BI challenges

Perceptions, values, guiding principles, actions	Challenge (and category)
Technology perception: Collect/process volumes of data because technological capability exists (Accenture, 2008; Willcocks and Whitely, 2009:191).	Focus is on generating data rather than using BI (U1, 9).
Capability perception: Where a decision-maker is unable to use BI, the problem is believed to be with the decision-maker (Atre, 2011).	Decision-making is not supported or facilitated, there is a gap between BI and business (U2, 5-8, A1)
Technology perception: By merely implementing a BI IT solution, BI is automatically enabled (Ackerman, 2005:1). Capability perception: The average business user has the time or know-how to use BI tools (LaValle *et al*., 2010:3; Quinn, 2007:4; Todd, 2009:36). Capability perception: BI users have the capability/know what to ask and what assumptions to make when using BI	Lack of understanding of how to use BI solution – which only provides information up to a point (U2-8, A1)

Perceptions, values, guiding principles, actions	Challenge (and category)
tools (Green, 2007:18; Ranjan, 2008:464).	
Product perception: If the BI product (e.g. a report/data) exists, it will automatically be used instead of intuition/experience alone (Davenport *et al*., 2010:1).	BI user experience is disorienting, frustrating, complicated and discouraging (U2, 3, 5, A1)
Technology perception: BI use measured by number of licences sold (Pendse, 2009).	Low use of BI is overlooked as it is not reflected in vendors' sales figures (U10)
Process perception: BI is a repeatable, automated process and generic, pre-configured BI can be mass produced (Cohen, 2008:26; Schick, 2005:5).	BI that is not valued is not used. BI business requirements are not met or are unclear. "One size fits all" doesn't suit all (U5-8; A1, 02)

It would be ideal if one of the perceptions identified above did not link to any BI challenges. One could then neatly conclude by advocating that the BI community examines their worldviews and makes adjustments to adapt to the utopic perception that does not result in challenges. Unfortunately, this is not the case. However, identification and discussion of BI's worldview has enabled insight into what could potentially be fundamentally wrong with this worldview. It is foreseen that BI's worldview is centred in a G-D Logic. This is discussed in an upcoming chapter.

8. Conclusion

This part of the literature study chapter presents an in-depth discussion of BI's worldview by examining the literature on BI, per worldview element. Worldview elements consist of: a model of reality (ontology); model of the past (explanation); model of the future (prediction); values (axiology); guiding principles (praxeology); and source of knowledge (epistemology).

In terms of BI's ontology, discussions on the definition and scope of BI as well as various definitions of BI are examined to understand BI's reality, as subjective and fluid as this may be. What is identified is that BI is consistently perceived as one of four main perceptions namely, a: technology; process; product or; capability. Other insights are gained on each of the worldview elements of BI. These are taken forward to case study chapters where the literature's view of BI is compared with that in practice at Fortune Bank, as the case study.

Before this can be done, however, G-D and S-D Logic must be explained as, following the case study chapters, BI's worldview is examined through these lenses. The same approach of a worldview is used to frame the discussion on G-D and S-D Logic.

CHAPTER 3 PART 3: GOODS- AND SERVICE DOMINANT LOGIC

Discussion of the emerging body of knowledge underpinning Goods- and Service-Dominant Logic

1. Introduction

Previous sections of the literature study chapter identified BI's challenges and described its worldview, recognising that BI's worldview results in behaviour and actions that, in turn, result in its challenges. Evidence of a dominant underlying G-D Logic emerges when BI's worldview and the resultant challenges are examined through G-D and S-D Logic lenses. This section of the literature study chapter explains what G-D and S-D Logic are and positions S-D Logic as a potentially viable approach for BI to be able to open new channels through which its persistent challenges may potentially be resolved.

This part of the literature study chapter establishes the basis of understanding of G-D and S-D Logic that are necessary for chapters that follow. To do this, it explains G-D and S-D Logic using the worldview framework presented in Part 2 of this chapter. However, before G-D and S-D Logic worldviews are examined, the notion of exchange must be explained.

2. The notion of exchange

G-D and S-D Logic are – simply put – lenses, mindsets, worldviews or philosophies according to which the notion of exchange is viewed (S-D Logic, 2012; Vargo, 2011b:4-5). In general terms, exchange refers to the act of giving and receiving (Hornby, 2005:506). The act of giving and receiving also applies in the context of G-D and S-D Logic, where the concept of exchange may be applied to economic or social acts of giving and receiving. For example, exchange for economic purpose where something is given and received in the market for financial gain, or social exchange without financial gain/economic purpose, such as that within a family or group of friends. Exchange may also refer to acts of giving and receiving that take place within BI, e.g. the exchange of BI services (e.g. consulting, training, support) or a BI system, report, data extract, etc. for financial gain. This may take place between BI vendors and organisations or between BI departments, as providers of BI, and other departments within the organisation. It may also take place between teams or individuals within BI departments.

The aim of exchange is to give those involved in the exchange access to resources that provide them with benefit (Chandler and Vargo, 2011:35). Exchange concerns itself with interactions and relationships and therefore always consists of at least three components: two nodes (e.g. giver and receiver) and a thread (e.g. whatever is exchanged) (Schultz and Gnoth, 2008:129). This highlights the broad scope that exchange is applicable to: from exchange that takes place within an economic market, to social exchange, to BI (which may fit within economic exchange) or even to the "process of knowing" (Gummesson, 2001:27). Gummesson (*ibid*) describes this as an ex-

change between (1) the knower (researcher) and (2) the known (the outcome of the research), connected by (3) the "process of knowing" as the thread.

Schultz and Gnoth (2008:129) maintain that exchange (and the lenses through which it is viewed) is directly applicable to organisations, employees, suppliers, customers and other stakeholders. This thesis extends their proposition by positioning BI as a series of exchange processes and discussing exchange within the BI process. Exchange is contextualised in terms of two of the worldviews that have emerged through which it may be perceived (G-D and S-D Logic). BI should therefore be understood as an exchange process that can be examined through G-D and S-D Logic lenses.

It is already established that G-D and S-D Logic are worldviews according to which the notion of exchange is viewed (S-D Logic, 2012; Vargo, 2011b:4-5). G-D and S-D Logic worldviews are now explained, following the worldview framework based on the work of Apostel and van der Veken (1991), Heylighen (2000), Vidal (2008:4-6) and Funk (2001) that was presented in Part 2 of this chapter.

3. A worldview based on G-D Logic

Vargo and Lusch (Vargo, 2011b:4) have called the manufacturing-oriented (Lusch *et al*., 2008:11) process of exchange or the microeconomic and related marketing-management view "Goods-Dominant Logic". They identify that G-D Logic is a restricted, production and product-centred orientation that provided the fundamental direction for economic science and, later, for marketing (Vargo, 2011b:5). As such, at this point in time, it is identified that economic science and marketing are predominantly influenced by a worldview based on G-D logic, but that a Service System worldview based on an underlying philosophy of S-D Logic and theory of Service Systems is emerging (Spohrer and Maglio, 2008:243).

G-D Logic is now discussed in terms of its worldview elements. The epistemology and prediction elements' order has been shifted within the framework to facilitate the flow of the G-D Logic discussion.

3.1 G-D Logic informed worldview: A model of what is (ontology)

A G-D Logic informed worldview – reflected below in Figure 10 – typically sees value in the linear series of activities of manufacturing and distributing tangible goods, designed and built by a producer, with a consumer in mind (Vargo and Lusch, 2004a:5; Edvardsson *et al*., 2011:540). The producer creates value (without the "interference" of customers (Lusch *et al*., 2008:6)) and embeds it in the physical goods by determining upfront what the features and attributes of the goods will be and which customer segment is likely to buy the goods (and thereby receive value). They

then promote the goods to this customer segment as their target market, using advertising, marketing and promotions. Goods are distributed by means of a supply chain and are sold through exchange transactions of goods and money (Edvardsson *et al*., 2011:540).

After the producer and consumer have exchanged the goods, value is depleted from the producer and transferred to the consumer, who consumes or destroys the value of the goods (Edvardsson *et al*., 2011:540). The point of exchange is where value is seen to occur and is referred to as "value-in-exchange" (Nam and Lee, 2010:1764). Producer and consumer are typically separated and are seen to have distinct roles. The producer is seen to be the creator of value (in terms of place, time and use) and the consumer the destroyer of value (Edvardsson *et al*., 2011:540; Lusch *et al*., 2008:6). Value is seen to be embedded in goods, which can by standardised and inventoried until sold – retaining their value during inventory (Vargo *et al*., 2010:136).

The producer is typically seen to capture the market if they manage to outdo their competitors in terms of selling more outputs or units, and through the sale of goods, makes a profit. Organisations function to optimise production variables. There is a focus on standardisation, design for production efficiency and the maximisation of outputs which can be sold for profit – which, even if unsold, may retain their value (Vargo and Lusch, 2004a:5; Lusch *et al*., 2008:6).

Services are also recognised by G-D Logic. However, due to G-D Logic's focus on units of output (goods), it sees services only in the context of goods – as "that which is not goods" and therefore discounts services as a byproduct or residual of goods (Kowalkowski and Ballantyne, 2009). Services are "lumped" into the "last" economic sector (tertiary), seemingly sidelined after agriculture and manufacturing (Miles and Boden, 2000:1-3). Services are differentiated on the basis of four relative shortcomings known as the IHIP characteristics - intangibility, heterogeneity, inseparability and perishability (inability to be inventoried) (Nam and Lee, 2010: 1761; Lusch *et al*., 2008:6).

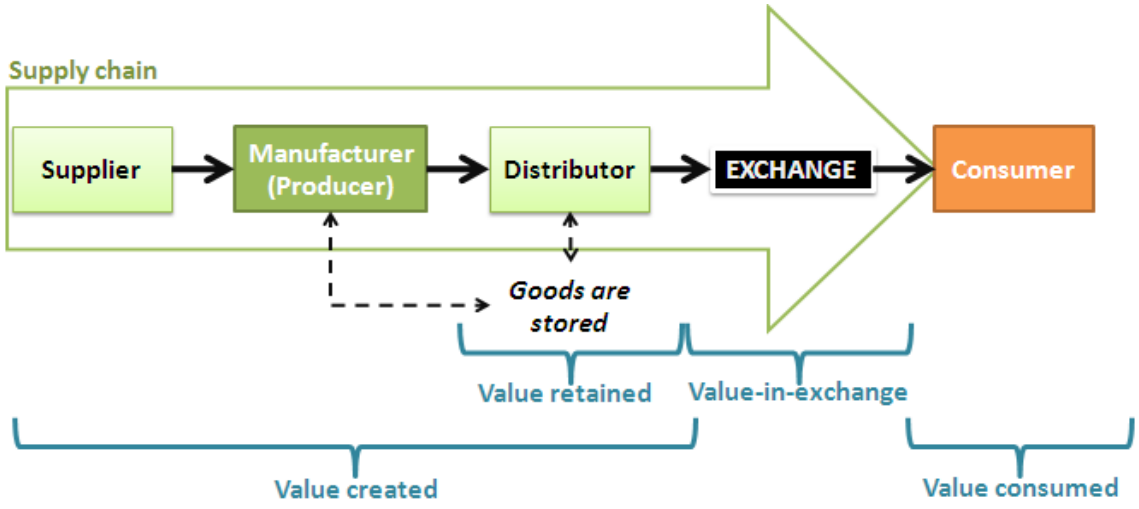

Figure 10: G-D Logic perspective of exchange (Based on Edvardsson *et al*., 2011:540; Nam and Lee, 2010:1764; Vargo and Lusch, 2004a:5)

In summary, the worldview informed by an underlying philosophy of G-D Logic focuses on the means and production, the producer, the product, the tangible, the transaction and the being (Vargo and Lusch, 2008c:25-27).

3.2 G-D Logic informed worldview: A model of the past (explanation)

G-D Logic first emerged as a term in the work of Vargo and Lusch (2004a) to describe the focus of exchange on goods (as described in the ontology above). However, its roots extend to the turn of the previous century and the Industrial Revolution (Vargo, 2011a:218; Vargo, 2011b:4). It was at this time that Adam Smith published his seminal work on economics, "The Wealth of Nations" (Vargo *et al.*, 2006:30). G-D Logic is said to be grounded in the work of Smith and the economic philosophy and science that followed (Vargo *et al.*, 2009:34; Vargo *et al.*, 2010:136). Smith started with a wide explanation of exchange and value but was of the opinion that only certain types of labour were productive or contributed to the gain of national wealth. At the time, national wealth was a thing of aspiration, as it determined social well-being (Vargo and Lusch, 2004a:12; Vargo *et al.,* 2008:147).

Based on this, Smith designated tangible-good producing activities as productive and all other activities as unproductive. Activities classified as unproductive were not useless or non-essential, but simply did not contribute to national wealth through creation and export of surplus tangible goods (Vargo, 2011a:218; Vargo, 2011b:4). Smith's opinions amounted to a view that economic exchange should be based on output: tangible goods with embedded value. Newtonian mechanics contributed to this view through establishing matter with properties and deterministic relationships (Vargo, 2007:5).

This neoclassical model of economics, with its strong ties to manufacturing as a result of the focus of the Industrial Revolution (Lusch *et al*., 2008:6), established the foundations of G-D Logic for the economic science of exchange (Vargo, 2011a:218). A change occurred during the 1960s resulting in de-industrialisation when a post-industrial society shifted their demand from manufactured goods to services. However, the economic crises of the 1980s brought about reflection on and questioning of this movement and, to stimulate the manufacturing industry and economy, re-industrialisation took place (Miles and Boden, 2000:1-3). The business of exchange remained focused on the G-D Logic perspective (Doan and Kosaka, 2011:1).

3.3 G-D Logic informed worldview: Source of knowledge (epistemology)

With roots that reach back to the Industrial Revolution (Vargo *et al.*, 2006:30) G-D Logic is informed by the viewpoint that national wealth can be improved through the division of labour and an increase in productive capacity and sale of tangible units of output, i.e. value-in-exchange (Spohrer and Kwan, 2009:7).

Lusch *et al*. (2008:5) highlight the limitation in that this viewpoint is oriented towards manufacturing and uses words such as: product, production, goods, distribution, supply and consumption. They indicate that this diction is a disadvantage as it relegates service/s to a supporting secondary role. In line with this, the lack of effort to define service is identified to have has resulted in a restrictive myopic view of exchange, visible through the distortions in the economic taxonomy and related accounting systems (Hill, 1977:320; Miles and Boden, 2000:1-3).

3.4 G-D Logic informed worldview: Values (axiology)

A fundamental value of a G-D Logic informed worldview is value-in-exchange (Lusch *et al*., 2008:9; Nam and Lee, 2010:1764). The concept of value-in-exchange implies that value is determined and created upfront by a provider (and potentially also a supplier) in the production and distribution process and that it is either stored (where value is retained) or transferred to the customer upon exchange – achieving value (Vargo and Lusch, 2004a:5; Lusch *et al*., 2008:6). Value is predetermined according to place, time and use by the provider, based on their knowledge of what goods and features will be of value to one or more customer or customer segment. After exchange has taken place, the customer consumes or depletes the value (Edvardsson *et al*., 2011:540; Lusch *et al*., 2008:6).

G-D Logic therefore places value on the provider, production and the tangible goods that are produced. This is supported by G-D Logic's focus on activities that take place from the supplier and provider point of view up until the point of exchange where the goods are distributed. These are, for example: the linear exchange process (Vargo and Lusch, 2004a:5; Edvardsson *et al*., 2011:540); standardisation and production efficiency (Vargo and Lusch, 2004a:5; Lusch *et al*., 2008:6); tangible units of output (Miles and Boden, 2000:1-3); ability to group and inventory goods (Nam and Lee, 2010:1761); and separation of customers and providers so that customers do not "interfere" in the production process (Lusch *et al*., 2008:6).

In contrast, G-D Logic does not value the customer process that takes place after exchange, i.e. the use of the goods that are exchanged. By implication, it can be seen that G-D Logic does not value the customer, other than as a production or marketing variable that must be taken into account in so far as it must be marketed or sold to. As it values the tangible good or unit of output, value is also not placed on intangible services. In fact, activities producing intangible services are discounted as unproductive and, although not seen as useless or non-essential, they are simply not seen to contribute to the creation of wealth (Vargo, 2011a:218; Vargo, 2011b:4). Services embody characteristics that are not valued – or are seen as disadvantageous – by a G-D Logic mindset, namely: heterogeneity and inseparability (making them difficult to group and inventory) as well as perishability (which leads to inability to store and retain value) (Nam and Lee, 2010: 1761; Lusch *et al*., 2008:6).

3.5 G-D Logic informed worldview: Guiding principles and actions (praxeology)

G-D Logic is guided by many of the principles from disciplines such as manufacturing, operations, logistics/distribution, economics etc. Those informing G-D Logic can be seen to promote, for example, a linear supply chain (Vargo and Lusch, 2004a:5), market acquisition through increased sales (typically of tangible output), standardisation of design, production efficiency and maximisation of outputs that can be sold for profit (Vargo and Lusch, 2004a:5; Lusch *et al*., 2008:6).

Principles from Porter's value chain or 4Ps model that emphasise discrete, linear stages (Porter, 1985), emphasise the producer and production and considers customers to be resources that must be targeted, captured and segmented (Vargo and Lusch, 2004a:5) provide an example of supply chain guidelines that have informed G-D Logic (Ballentyne *et al*., 2008:45; Callaway and Dobrzykowski, 2009:225). Another example is of manufacturing principles such as the "lean manufacturing" principles that originated in Japan (Key Lean Manufacturing, 2011). What is significant about these is that while many of these principles focus on the human element and quality aspects of manufacturing, these principles still focus on the tangible output, separation of customer and provider, maximising production and inventory efficiencies, and on building quality (value) into the tangible output.

Within the systems engineering, IS and software engineering disciplines, an example of guiding principles are of those that stem from the traditional Systems Development Lifecycle (SDLC) methodologies. G-D Logic is informed and – in turn – appears to inform traditional SDLC methodologies such as the so-called "classic" Waterfall Approach (Tech Target, 2011). Methodologies such as this tend to focus on separation of customer and provider, upfront development whereby the provider embeds value and delivers this to the customer as a finished product and minimal input from the "consumer" (end user, sponsor or another key stakeholder). The Waterfall Approach is a linear and sequential approach where teams are separated and stage-by-stage design, development, testing and maintenance take place (Tech Target, 2011).

3.6 G-D Logic informed worldview: A model of the future (prediction)

Various research efforts and developments in ICT, economics, marketing and other areas and disciplines highlight that G-D Logic does not serve exchange optimally (Vargo and Lusch, 2004a:2, 2007:2). The surfacing of this discontent – which is discussed in Section 5 – is perhaps indicative of a shift that starting to take place and may be expected in the future. Although the future cannot be predicted with any amount of certainty, the emergence of this discontent makes it reasonable to say that the era whereby G-D Logic is accepted wholeheartedly and unquestioningly is potentially drawing to a close. Spohrer and Maglio (2008:243) draw attention to the emergence of a Service System worldview based on an underlying philosophy of S-D Logic and theory of Service Systems. Emergence of such a worldview (in addition to the shift in BI's dominant

worldview that is proposed in this thesis) may be a catalyst for a shift from G-D Logic for economic exchange, marketing and various other social and economic exchange activities – including the exchange that takes place within BI.

4. A worldview based on S-D Logic

A worldview based on S-D Logic is now discussed, followed by a discussion in the next section of the need that is identified to shift from G-D to S-D Logic, i.e. where G-D Logic fails and why it is believed that S-D Logic offers alternative solutions to overcome BI's prevailing challenges.

4.1 S-D Logic informed worldview: A model of what is (ontology)

4.1.1 What is "service"?

"Service" must be explained before the S-D Logic informed worldview is discussed. The distinction between service and services represents a fundamental shift in understanding from the traditional view of goods and *services*. "Services" creates some confusion, as it carries the connotation that only traditional services are included while "service", as referenced by S-D Logic, has a significantly wider meaning (Rust and Thompson, 2006:291; Vargo, 2008:211; Vargo and Lusch, 2008a:255; Vargo and Lusch 2008c:25). In terms of S-D Logic, service is defined as the application of competences (skills and knowledge) through deeds, processes and performances for the benefit of another entity or the entity itself (Vargo and Lusch, 2004b:324-335; Lusch and Vargo, 2008).

In terms of this, service can refer to traditional services, such as hairdressers' or consultants' services, or it can refer to the exchange of a tangible product/good. In the latter case, the product is merely the transport mechanism for the provider's skills and knowledge, which are embedded in the product and deliver the service when the product is used. Vargo and Lusch (2011:1302) explain S-D Logic's "service" eloquently in everyday English as, "I received excellent service from my physician" (direct service through another actor) and as "I received excellent service through my lawn mower" (indirect service through a good). This represents a shift in how economists have defined "services" – i.e. as intangible products; the absence of primary or extractive industry (fishing, timber, mining, agriculture) or secondary or manufacturing (of tangible products); or residually, as what goods are not (*ibid*). This distinction is reflected in Figure 11, which also reflects the shift in understanding of goods and service/services from a G-D Logic view of exchange to an S-D Logic view of exchange.

As stated in section 2, Schultz and Gnoth (2008:129) examine exchange in the context of the organisation. They highlight that exchange is directly applicable to organisations, employees, suppliers, customers and other stakeholders. They apply S-D Logic principles to the organisation,

showing how service is also applicable at an organisational level – between organisations and within the organisation. Figure 12 reflects this, relating to their identification that exchange concerns itself with interactions and relationships and consists of at least two nodes (e.g. giver and receiver) and a thread (e.g. whatever is exchanged) (*ibid*). This thesis highlights that exchange is directly applicable to BI and applies S-D Logic to BI, referring to an "S-D Logic informed worldview". As S-D Logic is the philosophical branch of the discipline of Service Science, it is now contextualized in terms of Service Science.

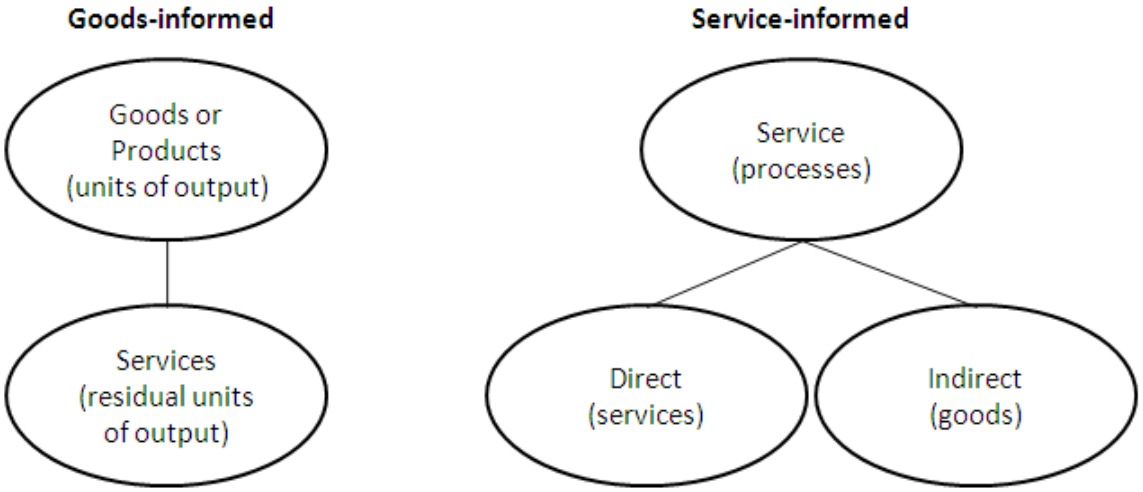

Figure 11: Hierarchies of exchange for goods- and service-informed worldviews (Adapted from Kowalkowski and Ballantyne, 2009)

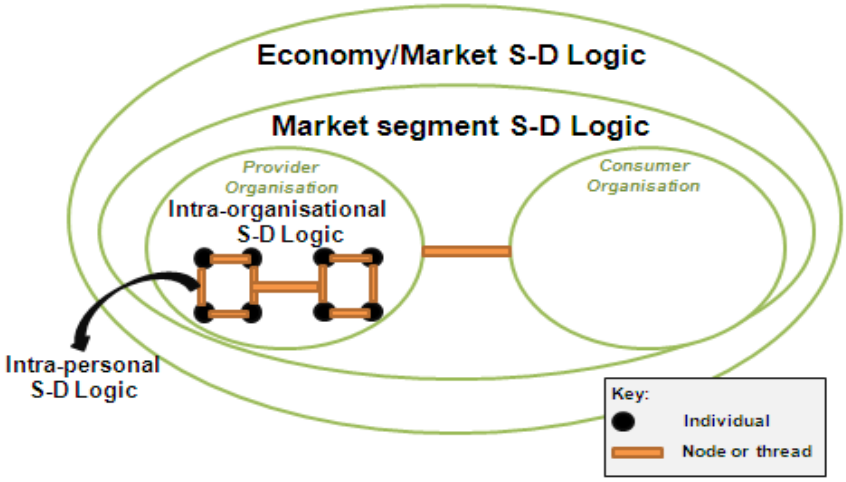

Figure 12: Intra-organisational S-D Logic (as adapted from Schultz and Gnoth, 2008:130)

4.1.2 Service Science in context: an interdisciplinary field

Service occurs within Service Systems – which are identified as an emerging worldview (Spohrer and Maglio, 2008:243). Spohrer and Kwan (2009:4) define the Service Systems worldview as a view that the world consists of populations of normatively interacting Service System entities such as people, businesses, government agencies, nations, cities, hospitals, universities, etc. They

state that these entities interact within Service Systems via value propositions with the purpose to co-create value, although disputes do also frequently arise – in which case, governance mechanisms are invoked to resolve disputes. The emergence of the Service Systems worldview has led to inter-disciplinary fields of study such as Service Science Management Engineering and Design (SSMED), also referred to as Service Science, Management and Engineering (SSME) or simply as Service Science (Spohrer *et al*., 2007:71).

Service science is a multidisciplinary research and education effort (some accredit this to IBM – e.g. Barile and Polese (2009:3)) to study the methodology and technology for service innovation, design and delivery (Lin and Chang, 2009:429). Service science studies the Service System. The Service System is defined as: value co-creation configurations of people, technology, value propositions connecting internal and external systems and shared information (e.g. language, laws, measures and methods) (Maglio and Spohrer, 2008:18). It spans topics in commerce, the organisation, people and technology (Spohrer *et al*., 2007:71).

As reflected in Figure 13, Service Science is supported by S-D Logic as a philosophical foundation and the Service System as a theoretical foundation (Spohrer *et al*., 2008:4; Maglio and Spohrer, 2008:18). Both of these are discussed in upcoming sections 4.1.2.1 4.1.2.2. As the bodies of knowledge on S-D Logic and Service System Theory continue to grow through contributions from various disciplines and scholars (Spohrer *et al*., 2008:5-6), they influence each other, along with the inter-disciplinary field of Service Science – as reflected in the bi-directional arrows in Figure 13. Practical developments are also seen to have an influence on Service Science which, in turn, has an influence on them, i.e. a symbiotic relationship (Spohrer *et al*., 2008:5-6). Practical developments then also indirectly influence S-D Logic and Service System Theory. Practical developments include developments such as Service Management, Service Computing, Service Orientation, Service Engineering, Service Operations and Service Marketing – amongst many others which are emerging as quickly as Service Science develops (Spohrer *et al*., 2007:71; 2008:4).

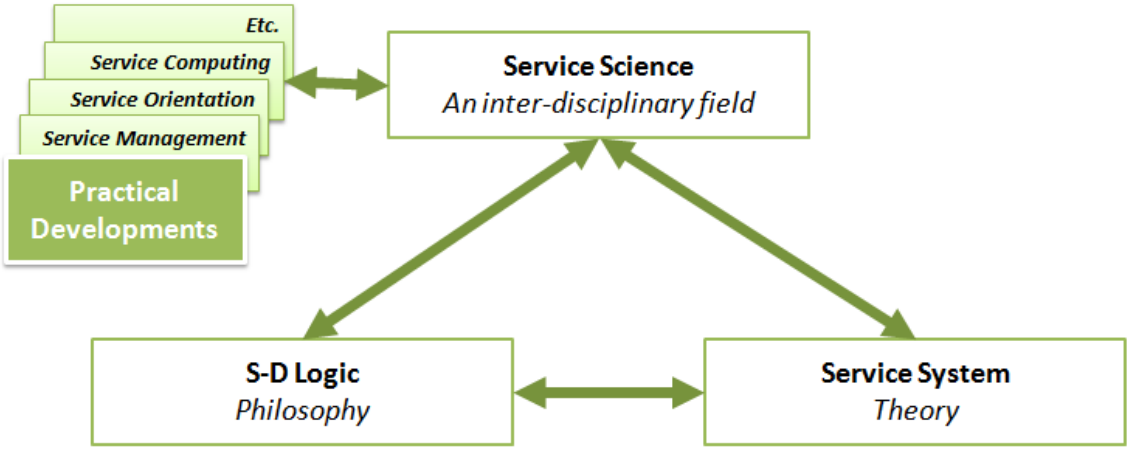

Figure 13: Service concepts in context (based on Spohrer *et al*., 2008:5-6; Spohrer *et al*., 2007:71; 2008:4)

4.1.2.1 Theory of the Service System

Service Systems exist in populations of Service Systems which, in turn, form part of a service ecology (also referred to as a service world or universe) (Spohrer and Kwan, 2009:3). Service systems are defined as complex, dynamic arrangements of resources in Service System entities which engage in dialogical interaction for the purpose of co-creating value. They are connected to each other in value networks, forming mutually-beneficial agreements with each other by means of value propositions (Spohrer *et al*., 2008:9).

Value propositions are reciprocal promises of value (Ballantyne and Varey (2006:334-5)), which lead to value co-creation (a win-win outcome) or disputes (either a lose-lose or lose-win outcome) (Spohrer *et al*., 2008:9; Spohrer and Kwan, 2009:4). Governance mechanisms are used to resolve disputes which may arise between stakeholders – customer, provider, authority or competitor – if value is not co-created. Value is measured according to stakeholder perspectives: customers evaluate quality; providers evaluate productivity; authorities evaluate compliance; and competitors evaluate sustainable innovation (Spohrer and Kwan, 2009:4).

Value networks are connected communities held together by the trinity of competences, relationships and information (Lusch *et al*., 2009:22). Value networks may also be referred to as value constellations, Service System networks or value chains, though value chains is more of a transitory term than a pure S-D Logic term. Value networks are abstractions that emerge upon assumption of a particular analysis overlay in the history of interactions amongst Service System entities (Spohrer and Kwan, 2009:3-4). Value networks are much the same as social networks, except that value networks extend to include organisations (Lusch and Vargo, 2006). Today, communities may even be linked in value hyper-networks where entities can connect via multiple types of networks laid over one another using different mechanisms (ranging from digital devices to social and biological bindings) (Chan and Hsu, 2011:3).

Service system entities are dynamic configurations of resources (Spohrer and Kwan, 2009:3). Service system entities may consist of people, technology, other internal and external Service Systems and shared information (Spohrer *et al*., 2007:72). Service System entities may be of an operand or operant nature. Operand refers to resources that are tangible, static and upon which action must be taken for them to be of use (e.g. coal). Operant refers to resources that are typically intangible, are dynamic and typically participate in the value co-creation process (e.g. knowledge) (Lusch and Vargo, 2005:91-92).

Service systems exist as a result of the need to exchange and co-create value, brought about by specialisation that occurs. As people, organisations, processes, etc. focus on a particular skill or knowledge, they become more dependent on each other for the others' specialisation. The process whereby increased specialisation – leading to micro-specialisation – occurs is referred to as

"complification" (Giarini, 1985:134). As a result, the customer – like the other Service System entities – is in an interdependent relationship with other Service System entities – therefore playing the role of both customer and provider, according to the nature of the relationship and the service that takes place. The interdependent relationship occurs both in consumer services and in the organisation. In consumer services, value co-creation takes place around episodic experiences and brands while, in the organisation, it is built upon long-term interactions over the life of the organisation (Chesbrough and Spohrer, 2006:39).

4.1.2.2 The philosophy of S-D Logic

S-D Logic is a philosophy, worldview, mindset or lens through which exchange (service) can be viewed. As stated above, it complements Service Systems theory and is recognised as a potential philosophical foundation from which a science of service, as well as the research of service systems can be built (Maglio and Spohrer, 2008; Vargo *et al.*2010:134). Its central tenet is that service is the basis of exchange. By this, what is meant is that when an exchange takes place, service is exchanged for service (Bastiat, 1848:161-162; Walras, 1894:225; Vargo, 2009b:374).

S-D Logic perceives that exchange consists of a sequence of activities, i.e. a flow of service. Customer and supplier collaboratively interact with each other, and with other economic and social actors who are also directly or indirectly involved in the exchange, to deliver a service. S-D Logic therefore sees that people *and* other entities (e.g. organisations, technology, processes/activities, etc.) deliver service (Lusch and Vargo, 2008; Vargo and Lusch, 2004b:324-335). In a mutually beneficial relationship, customer and provider (and other entities involved) co-create value by collaboratively working on resources (Lusch and Vargo, 2005:1; 2006:xvii; Spohrer *et al.*, 2008:9). They apply their collective knowledge to the resource to change it into something they find mutually beneficial. The S-D Logic worldview is therefore focused on the customer and the relationship and recognises knowledge (an operant resource) as a fundamental source of competitive advantage. The value that is created may be embedded in a tangible product (i.e. indirect service – which masks the true nature of service-for-service exchange, but is service nonetheless) or may be provided through a person (direct service) (Vargo and Lusch, 2011a:1319).

The value (or beneficial outcome) that emerges through this relationship depends on the customer's unique and subjective perception of what value is, upon use of the exchanged service. Emphasis is therefore placed on value-in-use. As such, the provider is seen to be incapable of unilaterally determining value upfront and needs the customer to co-create value in a mutually beneficial relationship. The provider can therefore only offer the customer a value proposition and not value. As such, value is not embedded in what is exchanged; only knowledge and skills can be embedded in what is exchanged.

These above concepts are elaborated on in section 4.4 where the ten Foundational Premises

(FPs) upon which S-D Logic is based are discussed.

4.2 S-D Logic informed worldview: A model of the past (explanation)

Although there may be conceptions that service is a contemporary logic (Randall, 2007:3; Finney *et al*., 2011:2-3), it could be argued that that awareness of S-D Logic concepts had their origins in the ancient world. Aristotle is recognised as the first to separate "use value" from "exchange value" (Fleetwood, 1997:729). However, even before then, Plato's Republic reflects the notion of voluntary exchange of applied skills and competences (Vargo and Lusch, 2011b:181). Since then, further evidence of awareness of S-D Logic has been recorded in the 1700s and 1800s. For instance, in the 1700s Galiani (1751:304) is quoted to have stated, "It is certain that nothing has a price among men except pleasure, and that only satisfactions are purchased". This corresponds with the more recent statements with a similar meaning: e.g. "importance of physical products lies not so much in owning them as in obtaining the services they render" (Kotler, 1977:8) and "customers do not buy goods or services: they buy offerings which render services which create value" (Gummesson, 1995; Vargo and Lusch, 2011a: 1319-1321).

The 1800s saw a number of the economic philosophers and scientists argue in favour of an economic law based on S-D Logic (Vargo and Lusch, 2008c:27). Frédéric Bastiat (1848:161-162) and Leon Walras (1894/1954:255) are two of many such authors. They saw economic law to be an exchange of services for services and also subscribed to the view that value arises from use, wants and satisfactions (Barbon, 1903:21; Dixon, 1990:304; Bastiat, 1860:40). Say and Mill are other notable contributors of this period. They saw production as the creation of utility and not matter or the rearrangement of matter, defining services as activities or immaterial products consumed at production (Vargo and Lusch, 2006:31; Mill, 1848:45).

Even authors who wrote around the time of the Industrial Revolution around the turn of the 19th century stated that the social order – both its structure and functioning of activities – is one of service in exchange (Delaunay and Gadrey, 1992:64-65). Their voices were, however, drowned out when the dominant view of the day – accredited to Adam Smith ("the father of economics") – became the view that economic exchange should be based on output – tangible goods with embedded value (Vargo, *et al.,* 2006:29, 31). The Industrial Revolution, with its focus on production and output of volumes of units with a view to increase national wealth, is recognised as the turning point when focus was placed on goods, production, units of output and a move towards a science of exchange of things (products), embedded with properties (utiles). Previous awareness of S-D Logic concepts was buried under the dominant focus on the exchange of goods. Service became "services", in line with the focus on units of output, but even services were side-lined. They were seen to be an unproductive residuum of goods and were even categorised in terms of goods, i.e. "that which is not goods" (Miles and Boden, 2000:1-3) and not specifically defined (Hill, 1977:320). The de-industrialisation of the 1960s provided some hope for a re-emergence of service, however,

this was offset by the re-industrialisation during the 1980s. Services remained a sideline of the other economic sectors – mining, agriculture and manufacturing.

Since then, however, both services and service have seen a turnaround. The services economy has grown from being a side-lined "that which is not goods" to now be recorded as the sector that contributes 60% towards Western democracies' Gross Domestic Product (GDP) (O'Shaughnessy and O'Shaugnessy, 2009:784). The economic paradigm has shown a shift from a product- to a service-based economy (Nam and Lee, 2010:1761, 1763; Doan and Kosaka, 2011:1). For the first time in history, there are more service jobs (40%) than agricultural jobs (39.6%) and manufacturing jobs (20.4%) (Spohrer and Kwan, 2009:1). Although this is a shift for services, which still denotes a G-D Logic outlook, it reflects that nowadays more people survive (and even thrive) without making a living from making physical goods – which demonstrates a turnaround for service.

The re-awakening of service can also be seen over the past thirty years through the growing number of academics and practitioners who have started studying service as a distinct phenomenon, with its own body of knowledge and rules of practice (Spohrer and Kwan, 2009:1). There have, however, been hints at awareness of service throughout the last century. For example, Kitson (1922:417-419) identified that tangible goods provide service; Penrose (1959:30) highlighted the service-provision of capital; Day (2004:18), the S-D Logic argument of value-in-use can be traced back to Levy and Boyd's1963 article "New Dimensions in Consumer Analysis" (ibid); and Mauss (1950) referred to the total exchange of service among early civilisations. Even in biology, the concept of mutualism (Bronstein, 1994) identified service-for-service exchange (Vargo and Lusch, 2011a: 1319-1321).

The awareness of service appears to have soared to new heights in January 2004 when Vargo and Lusch's article "Evolving to a New Dominant Logic for Marketing" appeared in the Journal of Marketing (Vargo, 2011a:217-218). Since then, the debate on service – including Service Science and its underlying philosophy S-D Logic – has had centre stage (Williams and Aitken, 2011). With various contemporary scholars across the globe and across disciplines explicitly contributing to the growth in the body of knowledge on service – perhaps the most notably Grönroos (e.g. 2000), Gummesson (e.g. 1995), Normann (e.g. 2001) and (Vargo and Lusch, 2011a: 1319-1321) – service has gained increased attention in academia. By the first quarter of 2012, Vargo and Lusch's original article had over 2,600 citations according to Google Scholar. S-D Logic, with its grounding in economics provides a conceptual framework that enables thinking about markets and exchange (Vargo and Lusch, 2004a:4-5) in general. In fact, the debate, which originally proliferated marketing, has now expanded to be included in the curricula of many other disciplines such as engineering, computer science, information systems, etc. (Ballentyne and Varey, 2008:11; Rust and Mui, 2006:50; Spohrer and Maglio, 2008:241). Even at a practitioner level, an increased effort to understand service activities is visible (Miles and Boden, 2000:1) as organisations re-structure technical and organisational resources to become service orientated (Sheth *et al*., 2006:56).

4.3 S-D Logic informed worldview: Source of knowledge (epistemology)

4.3.1 A service body of knowledge

Various disciplines contribute to the body of knowledge that informs Service Science. This body of knowledge is continuously expanding through contributions from scholars and professionals across the globe, studying and working in various disciplines. Section 4.1.2 reflects how Service Science as a discipline grows from contributions stemming from S-D Logic as a philosophy and Service Systems as a theory – as well as from knowledge from practical developments. Spohrer and Kwan (2009:15-16) identify specific professionals that contribute towards and can simultaneously benefit from Service Science. These are entrepreneurs, business consultants, scientists and engineers. They (Spohrer and Kwan, 2009:6-7) also identify ten academic discipline pillars of Service Science that provide an understanding of the Service Systems. For example, history, marketing, computing, anthropology, design, etc.

In addition to the growth of the service-informed body of knowledge through scholarly disciplines and professional practices, service-related knowledge is also growing as a result of the awareness and sense of opportunity brought about as specialisation increases (Spohrer and Maglio, 2008:243), specialised knowledge becomes more intensive, service-for-service exchange dominates modern economies, more people have service jobs than ever before (Nam and Lee, 2010:1761; Doan and Kosaka, 2011:1) and more people are making an income that is no longer based on the creation of new physical things (Spohrer and Kwan, 2009:1).

Although the incredible growth of “services” as an economic sector (O’Shaughnessy and O’ Shaughnessy, 2009:284) is not seen as the trigger of the growth in the service body of knowledge, it contributed by awakening the realisation that skills and knowledge are the most important resources (Vargo and Lusch, 2004a:8). Some of these factors highlight, on the one hand, the inefficiencies of G-D Logic and, on the other, the potential for S-D Logic. They have resulted in the phenomenon whereby a growing number of academics and practitioners study service as a distinct phenomenon with its own body of knowledge and rules of practice (Spohrer and Kwan, 2009:1).

4.3.2 Limitations identified in the source of knowledge of S-D Logic

A potential limitation or weakness that is identified in the epistemology of the service-informed worldview is that Service Science is “at the beginning of the beginning” and substantial work is still needed to integrate insights from the various disciplines (Spohrer and Kwan, 2009:16). Work is not just needed in empirical research, but also to establish and define S-D Logic concepts. In addition, the study of S-D Logic in the ambit of societal and ethical issues has largely been neglected to date and S-D Logic scope and boundaries still need to be set (Vargo and Lusch, 2008b:1).

Growth is also needed to establish governance mechanisms, ensuring that S-D Logic's governance mechanisms progress in parallel with the technological progress enabling service. A lag in governance may result in abuse of service, for example, producers who use prediction and control to manipulate customers rather than to use these to provide a better service for them. Other examples are of producers who unscrupulously gather customer data or inconvenience customers by "outsourcing" tedious "self-service" processes to them, engaging them in co-production rather than co-creation (Hilton, 2008:1-5). Paradoxically this provides the opportunity for contributions from various disciplines to refine and integrate Service Science.

O'Shaughnessy and O'Shaughnessy (2009:284-793) make statements that S-D Logic is centred in marketing and restricted to America. Vargo and Lusch (2009) however, put this argument to rest by referencing the numerous contributions towards Service Science that have been made since their 2004 article. This highlights the interdisciplinary and global nature of service contributions and discourse. Further arguments and debate on S-D Logic are discussed in Section 6.

4.4 S-D Logic informed worldview: Values (axiology)

Axiology provides the theory of values and goals to guide actions. As such, it is appropriate to discuss the Foundational Premises (FPs) of S-D Logic in this section.

The above sections introduce some of the concepts of S-D Logic. A deeper understanding of S-D Logic is, however, provided through an explanation of its ten FPs, as compiled by Vargo and Lusch. In January 2004 Vargo and Lusch's article "Evolving to a New Dominant Logic for Marketing" appeared in the Journal of Marketing (2004). Since then, S-D Logic has received much academic attention, leading to debate and discussion and expanding from the marketing discipline. In 2008, Vargo and Lusch revisited their initial S-D Logic article, providing further insights by updating the original eight FPs with a further two. The complete set of FPs is reflected in Table 8.

Table 8: Summary of the ten FPs of S-D Logic

Foundational Premise (FP) and description
FP 1: Service is the fundamental basis of exchange: At the core of any exchange, capabilities are exchanged for capabilities. E.g. it is not fish that is exchanged for grain, but fishing knowledge and skills for farming knowledge and skills (Vargo and Lusch, 2004a:10-11).
FP 2: Indirect exchange masks the fundamental basis of exchange: Indirect exchange occurs when exchange delivery vehicles (e.g. money, salaries, products) or ICT developments (e.g. medium of exchange is electronic) are used to facilitate exchange. Indirect exchange may result in in separation of customer and provider resulting in loss of knowledge sharing and mutual adaptation opportunities, time lags, loss of quality (Spohrer *et al*., 2008:10; Vargo and Lusch, 2004a:14).
FP 3: Goods are distribution mechanisms for service provision: Thought, research and design

Foundational Premise (FP) and description
(specialised skills, knowledge and the application thereof) are invested in products, over a period by a community, and are exchanged with the product (embedded) as the vehicle of exchange. It is not an operand resource (e.g. a tangible product) that is exchanged, but an operant resource (e.g. knowledge and skill). It is not the product that is purchased, but what the product provides. As per Leo McGinneva's famous clarification, "They don't want quarter-inch bits. They want quarter-inch holes" (Levitt, 2006:1). An ICT example is of on-demand access to a software service (Software as a Service (SaaS)), where use of the software is possible without owning it (Zhao, 2008:415).
FP 4: Operant resources are the fundamental source of competitive advantage: Resources that are hard to transfer, copy or combine are a source of competitive advantage (e.g. knowledge embedded in such resources) – with the opposite also being true (Barabba, 1996:48; Normann and Ramirez, 1993:69; Quinn *et al*., 1990:60; Vargo and Lusch, 2006:16). This becomes obvious when an organisation's ideas, designs, etc. are protected by Intellectual Property (IP), a patent or copy right (Vargo and Lusch, 2006:15). When knowledge is embedded in a value network, this is even harder to copy, resulting in a greater competitive advantage (Spohrer *et al*., 2008:10).
FP 5: All economies are service economies: This becomes clear when considering that service is at the core of every exchange (as per FP 1) and – even though tangible goods were the focus of previous periods due to a G-D Logic – goods are distribution mechanisms for service provision (FP 3). Even hunter-gatherer and agriculture/manufacturing eras therefore exchanged services and are markets of service (Spohrer *et al*. 2008:10).
FP 6: The customer is always co-creator of value: The customer is in an interdependent relationship with other Service System entities, playing an interchangeable role of customer and provider according to the nature of the relationship and service (Chesbrough and Spohrer, 2006:39). The flow of service does not end with exchange, but continues into consumption. The customer is responsible for co-creating value in consumption or use. An example from Spohrer and Maglio (2008:240) is of a doctor (provider) instructing a patient (customer) to eat certain foods and exercise. The provider performs certain activities to transform the customer's state, but the customer must also perform certain activities to transform their own state to receive full value of the service.
FP 7: The enterprise cannot deliver value, but can only offer value propositions: Value is created upon consumption (Gummesson, 1998:247) – i.e. value-in-use – therefore it is the customer who determines the value. Therefore, neither organisation nor provider can deliver value on their own, but can only offer value propositions. The value proposition represents what the customer stands to gain or sacrifice when accepting what the provider offers (Spohrer *et al*., 2008:11).
FP 8: A service-centred view is inherently customer oriented and relational: The intrinsic nature of a service-centred view is that it focuses on the customer and the relationship and is participatory. It is not narrowly concerned with the customer, but has a balanced service-for-service performance. Customer and provider both have rights and duties in terms of an agreement and inseparably co-create value in a relationship with each other and other Service System entities. The relationship may be a once-off or repeat transaction over a short- or long-term (Vargo, 2009b:375).
FP 9: All economic and social actors are resource integrators: Whether economic or social, Ser-

Foundational Premise (FP) and description
vice System entities or actors (individuals, technology, etc.) dynamically combine, construct and employ operand and operant resources to co-create value (Vargo and Lusch, 2008a:52).
FP 10: Value is always uniquely and phenomenologically determined by the beneficiary: Value is only created upon consumption (use) by the customer (beneficiary) (Gummesson, 1998:247). It is personal, experiential, contextual and meaning-laden (Vargo, 2009b:375), i.e. the customer who uses the service determines whether it is valuable to them, at the point when they use it – according to their own life-world. Edmund Hesserl's philosophy of phenomenology states that the customer's life-world is based on their own experience, the way they experience things and the meaning they attribute to the experience (Smith, 2009).

4.5 S-D Logic informed worldview: Guiding principles and actions (praxeology)

Various guiding principles can be inferred from the body of knowledge that informs Service Science. For example, the ten FPs provide guidance for the customer and the provider in terms of their relationship and interactions. An example is of FP 6, which implies that the customer must be involved and is responsible along with the provider in co-creating value. The literature does not, however, overtly provide a clear list of guiding principles that are widely recognised and debated or accepted in the same way as the ten FPs. Guiding principles that are provided tend to focus on isolated components of service provision. For example, Lusch and Vargo (2006:415, 2010:288) specifically offer normative guidelines for the organisation. Another example is of the steps presented by Tanniru (2007:418), which instruct how S-D Logic should be applied. Although not expressly stated as such, Tanniru's steps are from the viewpoint of the provider. Both sets of guidelines are provided in Table 9. Undoubtedly there are further guidelines within the literature, those provided in Table 9 just serve as examples of the guidelines that are available rather than an attempt to provide an exhaustive list.

Table 9: Guidelines to apply S-D Logic (examples from Lusch and Vargo, 2006:415 and Tanniru, 2007:418)

Guideline	Source
Be transparent and make all information symmetric in the exchange process. Because the customer is someone to collaborate with, anything other than complete truthfulness will not work.	Lusch and Vargo (2006:415)
Strive to develop relationships with customers. Ideally take a long-term perspective.	
View goods as transmitters of operant resources (embedded knowledge); the firm should focus on selling service flows.	
Support and make investments in the developments of specialised skills and knowledge that are the fountainhead of economic growth.	
Identify or develop core competences, the fundamental knowledge and skills of an	Tanniru

Guideline	Source
economic entity that represent potential competitive advantage.	(2007:418)
Identify other entities (potential customers) that could benefit from these competences.	
Cultivate relationships that involve customers in developing customised, competitively compelling value propositions to meet specific needs.	
Gauge marketplace feedback by analysing financial performance from exchange, to learn how to improve the organisation's performance and offering to customers.	

Further guidelines can be found within the scope of Service Science's practical developments such as Service Computing and Service Management. IT Service Management guidelines have been published for, amongst others, the Service Oriented Architecture (SOA) which is considered to be the mainstream IT architecture affecting IT application modeling, development and management (Jain, 2007:420), the IT Infrastructure Library (ITIL) (Lemieux, 2008:2), the Microsoft Operations Framework (MOF) (Microsoft, 2008) and the Service Management Framework (QUT IT Services, 2008). Numerous frameworks, models and architectures such as these are available from IT vendors, practitioner authors and consultancies. Academic literature also provides various service frameworks for application within the practice of Service Science. A few examples are, Nam and Lee's (2010:1772) proposal for a typology showing service innovation, the Computer-Aided Market Engineering (CAME) tool suite – which is actually a conceptual framework for service design within electronic market processes – from Weinhardt *et al*., 2006:79 and Doan and Kosaka's (2011:1) IT infrastructure-based service mediator model (which facilitates web information exchange based on S-D Logic concepts).

BI service frameworks have already been discussed in the literature study, where it is identified that these tend to focus on isolated fragments of the BI process and typically end with the presentation layer, e.g. an analytics application that is delivered.

The literature on service guidelines – within Service Science and overlapping with BI – highlights two things. Firstly, it is possible and accepted to apply Service Science within management and computing fields – amongst many others (marketing, engineering, etc.) as evidenced by the developments taking place within these fields. This indicates acceptance of Service Science principles in general. Secondly, a gap exists in the existing literature to provide service guidelines that encompass the full BI process and both provider and consumer. The framework provided as this thesis' main contribution contributes towards filling this gap.

4.6 S-D Logic informed worldview: A model of the future (prediction)

Current developments highlight evidence that, one the one hand, practical application of Service Science some organisations are applying S-D Logic successfully and that, on the other, the Ser-

vice Science community should be vigilant about monitoring application of Service Science in its true form as intended. In terms of the former, an example is of Nike, Inc. Nike has assumed the role of a value creation network architect rather than that of a manufacturer. It no longer manufactures or handles much of the physical movement of tangible goods, rather applying its competences to design products, build brands and marketing while outsourcing most other functions. Nike also incorporates the final customer in its value creation network – customers promote the Nike brand through prominent display of Nike logos on the apparel they have purchased. In this way, customers co-create the Nike brand, which they use as a resource to define their own identities (Lusch *et al*., 2008:11).

While Nike is an example of an organisation that makes Service Science work for it, it should be borne in mind that not all organisations manage to do this. In contrast, some misunderstand what is truly needed to be a service organisation, proffering to pursue true service solutions strategies but misunderstanding that a service orientation is not simply outsourcing all functions. Many of the Fortune 100 organisations claim to offer service solutions, which highlights the need to question whether service solutions are a significant offering or whether this is simply a "fashion statement" that is made while they fail to follow a true service solution strategy (Day, 2008; Kowalkowski, 2010:288). It is identified that further research is currently needed to build a distinctive and robust science of service (Lusch *et al*., 2008:6). The ultimate goal is establishment of a service theory based on S-D Logic as the underlying philosophy (Vargo, 2011b:4).

5. The need for a shift from G-D to S-D Logic

G-D Logic, which is identified in the next chapter as an underlying and restrictive logic of BI resulting in BI challenges, is seen as an inadequate logic that does not benefit today's exchange process (Vargo and Lusch, 2004a:2). It is believed that G-D Logic fails BI – causing or contributing towards many of its prevailing challenges – and that S-D Logic offers BI alternative solutions that can assist in overcoming prevailing BI challenges. A few examples that highlight this viewpoint are provided, first generally and then specifically in terms of BI.

Vargo and Lusch (2004a:2) draw attention to the G-D Logic perception that the organisation's success lies in increasing its market share. According to G-D Logic, the customer market is segmented or penetrated and customers are promoted to. They highlight that G-D Logic is restrictive as it sees customers merely as resources that can be captured or acted on. Organisations "capture" and then manage customers, often resulting in the customers losing their voice (Prahalad and Ramaswamy, 2004:13). Information distributed to customers is often perceived as propagandistic as it is often distorted, intrusive or even abusive. It is frequently one-sided, biased towards the producer and is not shared symmetrically (which allows balanced views from customers, employees, partners and other actors involved in the exchange). As a result, informed decisions cannot be made and value co-creation cannot be achieved (Edvardsson *et al*., 2011:544). An exam-

ple of the ill-effects of this outlook can be seen in Sony's alleged disregard to communicate known risks to its consumers. In May 2011 a few thousand Sony customers' credit card details and accounts were compromised. According to the media, Sony held back on informing customers of this risk when they were first aware of the attacks. Initially, only a few accounts were compromised and Sony allegedly chose not to communicate, favouring its reputation and believing further attacks had been stopped. According to reports, Sony favoured its reputation, as it was hoping to have stopped the attacks and maintain a low profile on them, but further attacks occurred where uninformed customers were then jeopardised (Gilbert, 2011).

In addition, G-D Logic overlooks the consumer's joint role and responsibility in creating value (Vargo and Lusch, 2004a:2). This is often to the detriment of the producer (and the customer and the entire network they form part of). In contrast to this oversight of the customer, consider a marathon where runners must compete successfully in several other races as an entry requirement. The provider thereby recognises the customer's role in creating value (e.g. a successful marathon that the customer is fit and able to finish and enjoy). This benefits the runner, the marathon provider as well as the network they form part of – e.g. medical support services will be less burdened with runners who are unfit and need medical attention as a result.

Another example is of the inefficiencies created by G-D Logic's perception of customers as value destroyers, who consume value that is embedded in products that are sold to them (Vargo and Lusch, 2004a:2). This highlights the G-D Logic view that value is perceived in exchange, rather than use (Akaka, 2007:1). This viewpoint's inadequacy is emphasised by Leo McGinneva's famous clarification about why people buy a quarter-inch drill bit – "they don't want quarter-inch bits. They want quarter-inch holes" (Levitt, 2006:1). The value is not only in the exchange, but rather in the use. In addition, the customer is not a value-destroyer, but has a role in creating the value (Vargo and Lusch, 2006:18): the producer of the quarter-inch drill bit needs the customer to drill the holes. The viewpoint of value solely in exchange is likely to cost the opportunity of a longer-term relationship that enables mutual adaptation and growth.

Hill (1977:320) identifies that G-D Logic's focus on services (rather than service) brings a restricting myopic view of exchange. Shortcomings of this myopic view are visible in the distortions in the economic taxonomy and related accounting systems. Traditional economic classifications focus on the output that organisation's produce, rather than on the competences and resources used to develop their service offerings (Vargo and Lusch, 2011a: 1319-1321). Such distortions are made visible where an organisation retrenches a department performing a specific function, only to hire the same people to perform the same function in an outsourced capacity. Prior to retrenchment, the department's activities may have been counted as *goods production*. However, after the outsourced function is set up, the function is counted as a *services* category (Hill, 1977:320). Vargo and Lusch (2011:1301) provide the example of this distortion in the example of a tailor. A tailor who makes custom suits in a private practice is classified as offering a tailoring service. However,

if the tailor works for an organisation in a cut-and-sew suit-making factory, he/she is classified as a manufacturing employee producing suits (goods). This highlights the meaninglessness of traditional G-D Logic based classifications.

Furthermore, new insights and opportunities are brought about by ICT progress and ongoing development and research within Service Science. For example, ICT progress makes it increasingly possible to exchange information separately from goods, thereby increasing opportunities to concentrate on core competences and outsource others and rendering most supply chain concepts inadequate (Lusch, Vargo and Wessels, 2008:11). Edvardsson *et al* (2011:541-549) advise that, according to their empirical investigation, an S-D Logic informed Service System outperforms a G-D Logic informed Service System. They compare two bus transport Service Systems in the same domain and with similar functionality, finding that the S-D Logic informed system evokes a better experience from bus users in terms of total overall experience and total time spent waiting and in transit.

G-D Logic can be seen to fail BI specifically in a number of ways. Based on the above discussion, it is evident that, with G-D Logic, BI users lose their voice (Prahalad and Ramaswamy, 2004:13), are disempowered from making informed decisions (Edvardsson et al., 2011:544) and are excluded (although sometimes willingly) from participation and the co-responsibility of creating value (Vargo and Lusch, 2004a:2). By focusing on the tangible product or output (a BI application, report or data), sight is lost of the user and the process that must take place after the tangible product or output is created. G-D Logic primarily fails BI as it focuses on production rather than on use, in effect neglecting the entire span of the processes that should be taking place after the tangible product is exchanged and the BI user or beneficiary attempts to obtain value from this. In terms of this, S-D Logic appears to be superior with its focus on the customer, the relationship and use. By applying S-D rather than G-D Logic to BI, BI customers/users are drawn into the creation process, thereby co-creating value and the processes after the tangible product is created are not neglected – instead they are focused on to the point where value is perceived by the BI user/beneficiary.

More broadly, Korhonen (2010) analyses the paradigm shift that takes place in IT in terms of S-D Logic, highlighting how G-D Logic suggests a goal-seeking system. He explains that the system can be abstracted as relatively self-contained and closed, with the goal to minimise costs and maximise profit, limiting organisational learning to incremental improvement within established structures. In contrast, he explains that S-D Logic suggests a purposeful system that exhibits will, it is able to change its goals and select both ends and means to pursue them. An S-D Logic IT system forms part of the bigger picture – the organisation and the context that the organisation fits into – as part of a greater open system that interacts with its environment. Participatory relationships and learning from innovation are encouraged.

6. The G-D and S-D Logic debate

The inadequacies of G-D Logic point towards the need for a shift from G-D to S-D Logic. However, it must be borne in mind that S-D Logic is still a "pre-theory" (Vargo, 2011b:4). It is not yet a conclusive and robust science that has been unquestioningly accepted. As a result, there is much debate and discourse on the topic of Service Science – including Service Systems theory and the philosophy of S-D logic. It appears that Vargo and Lusch's 2004 article on S-D Logic (2004) put the service perspective in the spotlight where it has attracted much dialogue and debate (Lusch and Vargo, 2006; Randall, 2007:32). Since this 2004 article, there have been at least six S-D Logic focused conferences, twelve S-D Logic special issues or sections in journals, hundreds of articles and presentations grounded in S-D Logic and thousands of citations and cross citations to S-D Logic related work – from various disciplines and countries across the world (Vargo, 2011a:217-218; Williams and Aitken, 2011). It is evident that this "open source" body of knowledge representing collective thought on the service perspective is growing and evolving through a collaborative effort from scholars and practitioners across disciplines and countries (Vargo and Lusch, 2011a:1320).

While much of this has been in support of S-D Logic, building up the body of knowledge on S-D Logic towards reaching its goal of becoming a robust science of service, the literature shows evidence that S-D Logic is also subject to a certain amount of scrutiny and even criticism. Three distinct factions or schools of thought emerge in the literature: supportive; resistant and; hesitant but critical and/or hopeful (Vargo, 2011a:217).

6.1 Faction 1: Supportive of S-D Logic

There are many who praise Vargo and Lusch for highlighting S-D Logic as a promising, robust and insightful alternative to the traditional G-D Logic mindset (Randall, 2007:31; Webster, 2006b:xiv; Rust, 2004:20; Day, 2004; Hunt, 2004:22; Vargo and Lusch, 2011a:1320). In fact, a move from the traditional G-D Logic mindset is advocated: it is identified that a level of maturity has been reached whereby knowledge drives and transforms the economy (Rust, 2004:25, Day, 2004). Rust (2004:25) identifies that this has been brought about largely through technological advancements and links advances in the service to the ICT progress. Maglana (2007) highlights some examples where the service perspective is already evident, stating that S-D Logic is already an ongoing, albeit implicit, phenomenon within the practitioner domain. Examples include: grid computing which changes how people access computing power so that this is similar to accessing electricity; Google's provision of spreadsheet and word processing services without having to own the software; Coca-Cola and PepsiCo's offering of healthier beverages – acknowledging that it is the service the beverage provides and not necessarily the beverage itself that is valuable to the consumer.

Furthermore, based on ICT progress, Randall (2007:27) predicts that, as technology progresses, the focus on service will intensify, thereby hastening the movement to accept the service perspective. This is echoed by Spohrer (2008b:25) who predicts a Moore's Law of service. Randall (2007:27) identifies that it is time to move away from the old school's product-centric focus, specifically portrayed in Porter's 4Ps model, as this old school way of thinking considers customers to be resources that must be targeted, captured and segmented (Vargo and Lusch, 2004a:4-6).

Logic that is already emerging across various disciplines is of partnership, networking, customer intimacy, proactive meeting of needs in a win-win situation, support for co-creation of value (Oliver, 2006) and focus on interaction between exchange partners (Gummesson, 2004:20). The emergence of Service Computing, management, marketing, engineering, etc. and the examples from the practitioner domain within paragraphs above attest to the emergence of a service approach across various disciplines. The spread of the service approach and orientation shows that changes in practice, although some of these are either nascent or implicit, are aligned with S-D Logic concepts and therefore supportive of S-D Logic.

Readiness for change is demonstrated through a change in attitude and awareness. Consider as examples, Nike Inc.'s service approach ((Lusch *et al.*, 2008:11) (as per section 4.6) or MasterCard's "priceless" advertising campaign (as per FP3 above) where the campaign reflects awareness that goods are not purchased but experiences or higher order needs are met. Consider IBM as a service forerunner in terms of research and a service example in itself with its successful and profitable shift from goods to service (Bjurklo, Edvardsson and Bebauer, 2009:494). Even consider the examples of self-service and mass customisation where technology is implemented to support service principles, e.g. providers extend opportunities for customer participation.

Maglana (2007) – who writes an article that, in essence, highlights the pros and cons of S-D Logic – examines S-D Logic from two key perspectives: the organisation as producer; and the consumer. His conclusions are generally complementary of S-D Logic, as he identifies benefits for both the producer and consumer if applying an S-D Logic mindset. He identifies organisational benefits of "a wider range of opportunities" and "maximisation of profits from limited operand resources". Benefits for the consumer are improved offerings and more responsible marketing.

6.2 Faction 2: Resistant to S-D Logic

Two key articles from O'Shaughnessy and O'Shaughnessy (2009; 2011) reflect strong antagonistic responses to S-D Logic. In both, loaded terms such as "radicals", "evangelists" (O'Shaughnessy and O'Shaughnessy, 2009:784), "revolutionaries" and "hucksters of ideas with radical claims" (O'Shaughnessy and O'Shaughnessy, 2011:1317-8) are used to describe Vargo and Lusch after the release of their 2004 paper on S-D Logic. O'Shaughnessy and O'Shaughnessy state that their argument against S-D Logic is founded solely on this 2004 paper

as “a contestable base” or “central premise on which this literary corpus rests” (O’Shaughnessy and O’Shaughnessy, 2011:1310-1311), to the exclusion of further research contributing to the S-D Logic body of knowledge. This discredits much of their argument (Vargo and Lusch, 2011a:1320) and also results in several unfounded statement, e.g. that the service perspective is limited to America and the Marketing discipline and it does not call for critical assessment or contribution from theory (O’Shaughnessy and O’Shaughnessy, 2009; 2011).

Had O’Shaughnessy and O’Shaughnessy reviewed the mass of literature that is available on S-D Logic, these arguments would have been countered. As Vargo and Lusch (2011:1320) counter-argue: it is apparent that O’Shaughnessy and O’Shaughnessy have missed the mass of literature on the service approach that reflects the cross-disciplinary and global nature of the service evolution. Vargo and Lusch (2011:1299-1301) also highlight the inaccuracy in the statement that calls for theoretical and empirical contributions have not been made. Vargo and Lusch (2011:1321) address these arguments from O’Shaughnessy and O’Shaughnessy in a structured and logical manner, addressing each individual argument. However, they (Vargo and Lusch, 2011a:1319-1321) eventually renounce their counter-arguing effort, identifying that the continued arguments of O’Shaughnessy and O’Shaughnessy (2009; 2011) are unfounded, unconstructive, represent a misunderstanding of S-D Logic and undermine scholars who have already contributed constructively to the S-D Logic body of knowledge (whom O’Shaughnessy and O’Shaughnessy dismiss without making the effort to read). At the same time, Vargo and Lusch (2011a: 1319-1321) encourage competent arguments, based on sound critical assessment where the existing body of literature has been referenced.

A further argument from O’Shaughnessy and O’Shaughnessy (2009:784) that warrants discussion is their argument that S-D Logic is a backwards step. They start this particular article with a statement that service has gained prominence due to the growing contribution the service economy in Western democracies is making to those countries’ Gross Domestic Product (GDP). Vargo and Lusch (2011:1299) respond with exception to the suggestion that S-D Logic is regressive and highlight that justification of an increased focus on the service perspective cannot stem from a transition from an agricultural to an industrial to a service economy. Quoting the service economy’s increased contribution to GDP in the context of “services” highlights a misunderstanding of the service perspective (Vargo and Lusch, 2011a:1319), however, appears to be a common error that a few authors make (e.g. Nam and Lee, 2010:1761; Doan and Kosaka, 2011:1; Ballantyne, Varey, 2008:11; O’Shaughnessy and O’Shaugnessy, 2009:784; Rust and Miu, 2006:49) except for those (e.g. Spohrer *et al*., 2007:71) who, while mentioning the increased contribution to GDP that the service economy makes, do so to highlight that more people are now performing jobs that do not produce a tangible output. Later O’Shaughnessy and O’Shaughnessy (2011:1311) attempt to remedy the perception by stating that they said an inference from the increased contribution of the service sector to GDP has resulted in Service Marketing being heralded as paramount.

6.3 Faction 3: Hesitant but critical and/or hopeful

This faction represents those who are a mixture of cautious and somewhat skeptical or curious and perhaps even hopeful, though uncertain if not unconvinced (Webster, 2006b:xiii; Randall, 2007:33). With regard to their criticism in comparison with Faction 2, this faction is less confrontational in their arguments against S-D Logic and its arguments represent work that appears to be more grounded in research and less grounded in emotion.

6.3.1 A need for clarification of lexicon and concepts

The first set of arguments is the constructive and accurate identification that further research and refinement are needed within S-D Logic. These highlight the need for further research and contributions – as called for (e.g. Vargo and Lusch, 2008b:1) and identified (Randall, 2007:39) consistently in the literature. Vargo and Lusch (2011:1320), who invite contributions, state that they have neither invented S-D Logic, nor do they own it, indicating no particular issue with scholars' preference for "other labels" within the service orientation.

Day (2004:18) identifies that – as a result of the push towards service awareness brought about by changes and movements such as Service Marketing, customer relationship management, mass customisation, Service Computing, etc. – S-D Logic is already comprehensively composed as a framework. However, based on the philosophical and theoretical groundwork provided by academia and the methodological and technical foundation provided in practice, he urges further support from academics and practitioners to make the opportunity presented by S-D Logic a reality. Finney *et al*. (2011:3) also plead for academics and practitioners to connect S-D Logic theory and practice, or face negative consequences in both areas.

Many (including O'Shaughnessy and O'Shaughnessy, 2009:784) identify the need for clarification in the S-D Logic lexicon. Normann (2001:98), Maglana (2007) and Rust (2006) caution of over reliance on a G-D Logic lexicon. However, Normann (2001:98) simultaneously recognises that, as with any dominant logic, other elements of logic will exist. Levy (2006:62) identifies that it will be difficult for organisations to escape the G-D Logic mindset if S-D Logic is not firmly grounded as a framework and if S-D Logic does not expand beyond the realm of philosophy. In addition, Schembri (2006:385) identifies that focusing on the product as either goods or services negates any focus on how the customer experiences that product – obscuring the customer's needs.

Others highlight ambiguity in S-D Logic. E.g. it is stated that "service" is a term that has become confusing and overloaded (Zhao, 2008:415) and that "services" is just another word for "value added" (Prahalad and Ramsaswamy, 2004). Ambiguity is also evident in the use of "coproduction" and "co-creation" – some (Spohrer and Maglio, 2008:240) use these terms interchangeably while others (e.g. Hilton, 2008:1-5) abhor this. Absence of definitions and interchangeable use of terms

such as “client”, “customer” and “consumer” create further ambiguity.

Another argument in line with this – which is also constructive – is that S-D Logic is too conceptual and abstract, lacking sufficient empirical support and objective realism (O’Shaughnessy *et al*., 2009:784-793; Gummesson, 2006 (although he is generally in support of S-D Logic); Shugan (2004); Webster (2006a); Deighton and Narayandas (2004). Comparing S-D Logic to Porter’s 4Ps, Maglana (2007) also identifies weaknesses in the conceptual, abstract and un-actionable nature of S-D Logic, calling it a “loose framework undergoing further construction”. He (Maglana, 2007) calls for clarification and research on how to make S-D Logic more actionable, specific and measurable – asking how it affects the organisation’s profit or bottom line.

Plé and Cáceres (2009:431-434) add to these arguments by identifying further S-D Logic research that is needed due to the neglect of research on disputes that take place, or “co-destruction” as opposed to “co-creation of value”. They argue that, although authority mechanisms are identified, there is an over-optimistic view of the inevitability of value co-creation. In the same vein, Hilton (2008:1-5) warns about the “dark side” of self service, where producers unscrupulously gather customer data or inconvenience customers by “outsourcing” tedious “self-service” processes to them.

6.3.2 Inappropriate focus

The next set of arguments asserts that S-D Logic has an inappropriate focus. Prahalad and Ramaswamy (2000; 2003; 2004) state that S-D Logic is too focused on the organisation and is obsessed with interaction between customer and provider. At the same time, Maglana (2007) identifies a neglect of focus on the customer and O’Shaughnessy and O’Shaughnessy (2009:284; Vargo and Lusch, 2011a:1319) allege “too much technology”. Vargo and Lusch (*ibid*) respond to the statement that S-D Logic has too much of a focus on technology by questioning the validity of this argument in light of the volume of theoretical contributions that are not focused on technology.

Without justifying the remaining arguments in this section (this too subjective), it is identified that when applying S-D Logic it is critical to identify all resources, stakeholders and participants. S-D Logic highlights the importance of customer, provider, experience (value-in-use) and the entire value network. Therefore, the focus that is placed on these different entities depends on the perspective of whoever is applying the logic. For example, when applying S-D Logic within an organisational context, all resources, stakeholders, participants and their roles, perspectives and interests should be identified and considered. Spohrer and Kwan’s (2009:11) outline of Service System Theory provides a clear list of who and what should be considered.

The need for further research is identified here again, possibly in the form of guiding principles or even CSFs that are applicable to S-D Logic. In response to this need, this thesis provides guiding

principles for BI from an S-D Logic viewpoint (in the Solution Chapter).

6.3.3 Neglect of newer logic

A further argument is that S-D Logic neglects other newer logic. Two examples of this argument are described below. However, it is recognised that, as a result of the rapid pace of development within the service body of knowledge – made possible through practical and theoretical contributions – there will always be new developments emerging. The researcher is hopeful, however, that newer logic will be aware of S-D Logic and disprove and replace it, or – preferably – contribute towards growing the S-D Logic body of knowledge. Based on the volume of fervent contributions that can already be seen to contribute towards growing S-D Logic, it is believed that this is the more likely option.

One example of this argument is from Prahalad and Ramaswamy (2004:7) who identify experience-centric logic as a new logic to be incorporated into S-D Logic. Experience-centric logic focuses on the experience rather than – as they state S-D Logic does – on the organisation, customer, provider or relationship (Randall, 2007:35). It is worth noting that, while Prahalad and Ramaswamy argue for representation of newer logic, their articles are generally supportive of S-D Logic – although, as reflected in sub-sections above, they do provide constructive criticism. Their argument in this context is valid. However, it should perhaps be stated as more of a guideline that S-D Logic can incorporate. For example, S-D Logic should ensure that it places focus on the experience (value-in-use), in addition to taking the resources, stakeholders, etc. into account.

Another example is from Sampson *et al.* (2010:31) who argue that S-D Logic is inadequate, in favour of their new strategic application. They compile their "Process DNA" strategic application based on a combination of S-D Logic and Unified Service Theory (UST). UST is identified as a basis for Service Operations management, although it is not defined by Sampson *et al*. They argue that it can be used to complement S-D Logic by compensating for specific S-D Logic weaknesses, e.g. S-D Logic does not discriminate explicitly between service and non-service activities. They go on to identify non-service activities as production of "make-to-stock" goods that are produced to keep stocked in an inventory until needed, where customer input is not needed at the time of production. A fundamental flaw in their argument that highlights a possible misunderstanding on their part of S-D Logic and the concept of "service" is that S-D Logic already applies to "make-to-stock" goods, value cannot be embedded in such goods with the view of retaining the value without participation from the customer (e.g. this could be possible for items where value is co-created and part of the customer's requirement is storage of the goods until such time as needed). Despite this, Spohrer and Kwan (2009:9) list Sampson's Unified Theory of Services as an emerging discipline that contributes to Service Science through advanced views of Service Operations as a distinct scientific field.

7. Positioning S-D Logic as a viable approach for BI

S-D Logic cannot be proved/disproved (Williams and Aitken, 2011). However, it can be demonstrated as a viable approach. This thesis demonstrates how S-D Logic is a viable approach that can be used to address BI's challenges and that a shift to S-D Logic can yield certain benefits for BI. Furthermore, use of S-D Logic does not suggest that it is superior to other logics – existing or emerging – it simply addresses the evident need for a broader view under which BI exchange may be understood (Yazdanparast *et al.*, 2010:379; Vargo, 2009a). Based on this, S-D Logic is unashamedly taken as the point of departure, accepting that the service mindset is conceptual and in need of further research and refinement as well as the other arguments raised against it (as discussed in the section above).

The reason that the arguments in the section above have been raised is therefore to identify insights from the academic community applying and learning from S-D Logic as this body of knowledge emerges. Therefore, the above discussion of arguments for and against S-D Logic is of merit since it identifies insights that, firstly, reflect the viability of using S-D Logic as an approach to BI and, secondly, must be addressed before use of S-D Logic is warranted. These insights are discussed now in light of further examples from this chapter in the sections on the worldviews above.

7.1 Insights emphasising the viability of using S-D Logic

Although S-D Logic is not yet unquestioningly accepted, it is seen to be promising and insightful. The necessary maturity to unlock the potential of S-D Logic is evident – both in developments in ICT (e.g. increased ability to separate information and tangible product) and in examples of business attitudes that are changing towards accepting and implementing a service perspective.

The fact that some of the shifts to an S-D Logic approach may not be consciously made as a result of a formal or planned adoption of an S-D Logic approach highlight the need for awareness of S-D Logic and the benefits that can be attained from using it – as well as the challenges that may result if not used. An example of the latter is of ICT developments that lead to workplace changes such as the ability for some employees to work from home. Where the employee is a provider, lack of awareness of S-D Logic benefits could potentially result in further separation of customer and provider (a G-D Logic approach) rather than increased communication through social networking tools (communication and networking being the S-D Logic approach). This further highlights not only the viability of using an S-D Logic approach, but the necessity for it. ICT has the potential to be used inappropriately, furthering the G-D Logic approach, with a negative impact. Insights gained through analysis of the arguments on S-D Logic reflect that the move away from G-D Logic is both necessary and beneficial. Benefits for both the customer and provider are identified.

In fact, the research discipline of MIS – encompassing ISs and thereby also BI – has been mandated responsibility to take a leadership role in developing S-D Logic research that contributes from an MIS perspective. MIS is seen to have an "enormous opportunity" resulting from the overlap in Service Management (which deals with management), and Service Computing (which deals with technical aspects) (Zhao, 2008:414). The opportunity for MIS (including BI) is reflected below in Figure 14.

7.2 Addressing insights about S-D Logic to warrant the use thereof

Not all literature demonstrates equal support for the promise of S-D Logic (Randall, 2007:3). The above section's discussion of arguments on S-D Logic identify that a core issue is the need for further research in particular areas of Service Science and in the service perspective as a whole. Paradoxically, while this highlights that use of S-D Logic as a philosophy poses a limitation or a risk, it also highlights the opportunity to contribute further research that is necessary and even invited (Vargo and Lusch, 2011a: 1319-1321). Rather than succumb to the perception that the emerging nature of S-D Logic is an insurmountable limitation and neglect to dare to contribute to this emerging body of knowledge, the risk/limitation is mitigated through provision of a solid foundation of literature explaining Service Science's current position (worldview) and through transparency in establishing how this can be applied to practice (the Fortune Bank case study).

In addition, the arguments above highlight the research opportunity that is presented by the weakness identified in S-D Logic in terms of the need for it to focus appropriately on – e.g. – experience, the customer, etc. This thesis contributes by providing a framework and guiding principles that are needed to address this weakness. While these are specific to BI, they can be applied in other areas and it is envisioned that they will stimulate further research and discourse. The guiding principles are provided in the Solution Chapter.

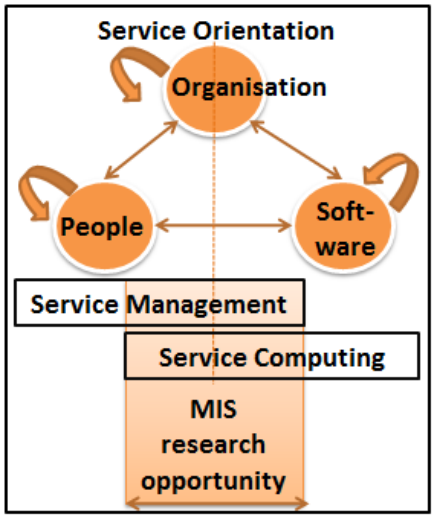

Figure 14: MIS research opportunity (adapted from Zhao, 2008:416)

8. Conclusion

This chapter provides a foundation of understanding of G-D and S-D Logic as lenses to view exchange. G-D and S-D Logic are lenses or worldviews through which exchange is viewed. Exchange, the process of giving and receiving, can be applied in a social or economic context. It can also be applied to BI as an exchange process, as applicable to this thesis.

G-D and S-D Logic are explained in this chapter according to the structure of the conceptual framework for a worldview. This contextualises G-D and S-D Logic concepts such as goods and service/s and positions S-D Logic as an underlying philosophy that – together with Service Systems theory – supports Service Science. The history, source of knowledge, theory of actions and guiding principles are discussed for both G-D and S-D Logic worldviews.

The need for a shift from G-D to S-D Logic is then highlighted in terms of the general inadequacies that emerge in G-D, brought to light as a result of various changes. Before S-D Logic is accepted as a point of departure for this thesis, current arguments for and against S-D Logic are examined. These identify several insights which are discussed in terms of using S-D Logic as an approach for BI.

The chapter concludes by identifying that S-D Logic is a viable approach that can be used to achieve benefit for BI, assisting BI to overcome its challenges. Chapter 4 identifies BI's worldview and challenges as experienced and perceived by case study participants. Chapter 5 examines these through the G-D and S-D Logic lenses.