

# A DESCRIPTIVE FRAMEWORK OF BUSINESS INTELLIGENCE DERIVED FROM DEFINITIONS BY ACADEMICS, PRACTITIONERS AND VENDORS

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## ABSTRACT

Although it is widely agreed that business intelligence (BI) plays an important role to ensure that information is available consistently and disseminated to organisational decision-makers, many authors point out that there is little agreement in the literature on a common definition of BI. This is not unusual for a field that is still being established, but a shared understanding would contribute to advancing the field. For this research, definitions of Pirttimäki (2007) and Chee et al. (2009) were used to identify *a priori* themes that are used to qualitatively analyse a selection of 27 BI definitions by researchers from the academia and industry, in order to derive an integrated descriptive framework of BI. Consequently, the implications and limitations of the definitions and the resulting descriptive framework are discussed. It is hoped that the framework can contribute to increase the shared understanding and counter the confusion arising from multiple definitions found in the literature. The descriptive framework also provides researchers with categories and descriptors for use in future qualitative research. Through further research, the framework and descriptors can be confirmed, expanded and refined by independent confirmation of coding, comparing further definitions to the framework, and by using the Delphi method to consult a panel of experts.

**KEYWORDS:**

business intelligence, competitive intelligence, definition, information needs, qualitative content analysis, sensemaking

**1. INTRODUCTION**

Ensuring that quality information is available consistently and disseminated to those in need of such information in an organisation is “among the most challenging tasks of the modern corporation and one of the most under-appreciated contributors to high performance and competitive advantage” (Neilson et al. 2010). Decision-making and the process of making a reasoned or rational choice among alternatives (Mallach 2000), is intertwined with management functions such as planning, co-ordination, monitoring, and control, all of which require that decisions be made. Systems that support organisational decision-making are therefore an important component in organisational information dissemination and have the potential to impact positively on performance and competitiveness.

It is not surprising that systems supporting decision-making have been evolving since the introduction of computers to commercial enterprises in the mid-1950s when these were used for repetitive data processing (hence, the original term, or DP). As the use of computers evolved, transaction processing came to denote the repetitive processing of business events and storing the associated data. Managers soon realised that summarised transactional data had value with respect to decision-making. In the 1970s, the first versions of analytical software packages, referred to as management information systems, appeared on the market (MIS). These systems primarily supported structured decisions (Mallach 2000).

The 1980s saw the release of spreadsheet software that continues to be used widely. By the mid-1980s and early 1990s, executive information systems (EIS) (Turban et al. 1995) were introduced and rapidly grew in popularity. These systems promised to provide top management with easy access to both internal and external information relevant to their decision-making needs (Rasmussen et al. 2002). The “easy access” was due to user-friendly interfaces and powerful analytical functionalities. Similar factors accounted for the popularity of decision support systems (DSS) (Carlsson et al. 2002), that included, among others, exception, reporting and an integrated data repository. It also supported semi-structured and unstructured decision-making tasks (Chen 1989). The most recent development of systems that support organisational decisions is BI.

Dresner of Gartner Research is credited with first using the term BI in 1989 to denote “a broad category of software and solutions for gathering, consolidating, analysing and providing access to data in a way that lets enterprise users make better business decisions.” However, this was not the first time the term was used. In his 1958 article, A

Business Intelligence System, Luhn (1958:314) defined a ‘business intelligence system’ as follows:

“Business is a collection of activities carried on for whatever purpose, be it science, technology, commerce, industry, law, government, defense, et cetera. The communication facility serving the conduct of a business (in the broad sense) may be referred to as an intelligence system. The notion of intelligence is also defined here, in a more general sense, as ‘the ability to apprehend the interrelationships of presented facts in such a way as to guide action towards a desired goal.’”

Luhn’s definition includes the government military in his conception of “business” in “business intelligence”, but subsequent use of BI was also intended to distinguish it from government and military intelligence activities (Fleisher 2003). Although the term BI was defined as early as the 1950s, the meaning ascribed to it today was defined only in the 1990s, and thus Dresner introduced this new generally ascribed meaning through his definition that includes technology in his definition of BI.

In spite of Dresner’s 1989 definition often being cited, many researchers point out that there is little agreement in the literature on a common definition of BI (Arnott and Pervan 2005; Pirttimäki 2007; Chee et al. 2009; Watson 2009; Foley and Guillemette 2010; Wixom and Watson 2010; Turban et al. 2011). This is not unusual for a research field that is still being established (Negash 2004; Pirttimäki 2007; Jourdan et al. 2008). Pirttimäki (2007) remarked that definitions of BI vary depending on the perspective from which it is defined. According to Arnott and Pervan (2005), definitions tend to reflect the background and interest of those defining it, most notably vendors of BI software. Foley and Guillemette (2010) found that researchers’ definitions tend to suit their particular research. Petrini and Pozzebon (2004) assert that studies of BI reflect two approaches: either managerial, with a process-orientation or technological, with an emphasis on the set of tools to be used. According to Watson (2009), this does not normally cause confusion because of the context in which the term is used.

Even if no confusion arises, and Kimball et al. (2008), as well as Turban et al. (2011) asserted that it does, establishing a common definition would contribute to advancing the field. Several researchers have attempted to address the lack of a common definition for BI. In 2007, Pirttimäki conducted a conceptual analysis and in 2009, Chee et al. reviewed the state-of-the-art of BI, where both studies investigated a range of definitions from which they developed a consolidated definition. According to Pirttimäki (2007), BI as a concept is not unambiguous and at the very least dualistic, comprising:

- “refined information and knowledge that describe the business environment, a company itself, and its state in relation to its markets, customers, competitors and economic issues; and
- process that produces insights, suggestions and recommendations (ie the refined information and knowledge described above) for the management and decision

makers.”

He added that the “information technology based systems used in analysing raw data and information and in storing and sharing valuable information and knowledge are considered an important part of BI.” Chee et al. (2009) reported that their study of definitions concluded that “the technological aspect of BI ... be considered as a BI system, whereas the process perspective is regarded as the implementation of BI systems. The product perspective is the result (ie actionable information) of analysis of business data which originated from various sources.” It appears that there is agreement from their reviews that BI involves technology, process and product. Yet there are differences: For Chee et al. (2009), the process entails the implementation of the technology or system, whereas according to Pirttimäki (2007), the process concerns management and decision-makers attaining insight from the product. This difference, together with the apparent differences arising from various perspectives discussed earlier, warrants a more detailed examination of the many definitions and descriptions of BI.

The purpose of this research is to analyse definitions and descriptions of BI by academics, practitioners and BI software vendors over the past decade, in order to derive a descriptive framework that can be used when conducting research on BI. Two questions to be answered, arise:

1. What are the themes captured in BI definitions and descriptions?
2. Are there sufficient commonalities in these themes in the definitions and descriptions of BI, based on the different research perspectives to allow a single framework to be developed?

In order to answer these questions, this research article is structured as follows: Firstly, the research methodology is discussed. Secondly, the data analysis is presented, together with the resulting descriptive framework. Thirdly, the researchers discuss the definitions and resulting framework, followed by a conclusion.

## **2. RESEARCH METHODOLOGY**

### **2.1. METHOD**

In order to determine the themes in the selected definitions and descriptions (hereafter definitions) of business intelligence found in the literature, an interpretive method, qualitative content analysis, was used. Qualitative content analysis is “a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns” (Hsieh and Shannon 2005:1278). In addition, content analysis provides an empirical basis for monitoring shifts in definitions. The data collected and analysed in this research can be compared to similar data collected at some point in future, to determine if such a shift has occurred.

## 2.2 DATA SELECTION

Definitions published during the past decade (2001-2011) by both prominent researchers (including Inmon and Nesavich (2008), Kimball et al. (2008), Turban et al. (2011), Wixom and Watson (2010) and less influential researchers in academia and industry, as well as leading BI software vendors (including IBM, Oracle, SAP, SAS Institute) were selected using purposive sampling (Zhang and Wildemuth 2009), based on the researchers' expertise and experience in the field (see discussion on trustworthiness below). Purposive sampling was used to ensure maximum variation (Patton 2002), that is, to ensure that definitions from all three perspectives (academics, practitioners and vendors) were included. As indicated above and in the discussion on limitations and future research below, the analysis does not claim to be exhaustive or definitive. It rather aims to serve as a framework that can be extended and amended with the addition of further definitions. In total, definitions from 27 texts were selected, with 46% (12.4) of researchers with an academic affiliation, 35.5% (9.6) practitioners, and 18.5% (5) vendors of BI software as listed in the respective publications. (Fractions result from co-researchers with different affiliations.) Definitions of BI were identified by using phrases such as "BI is ...", "BI is defined as ...", "BI refers to ...", "a term that ..." and similar introductory phrases, or as an entry in a glossary.

## 2.3 DATA ANALYSIS

Although some researchers only use word counts and key words in context (KWIC), content analysis can extend beyond such simple procedures. The strength of content analysis lies in its reliance on coding and categorising collected data. Similar in nature to a theme, a category is "a group of words with similar meaning or connotations" (Weber 1990:37). Themes and categories are constructed by coding, and researchers can select a variety of approaches. The two main approaches for coding data are firstly, an emergent approach, which is a conventional grounded theory approach, or secondly, an *a priori*-directed approach. In emergent coding, no prior themes are established, and only emerge through repetitive scrutiny and comparison of the data. With *a priori* coding, themes are established prior to the analysis, based upon literature, and are then applied to the collected data. Revisions are made as deemed necessary, based on the categories that emerge from the data. An *a priori* generation of themes from previous research is especially useful at the inception of data analysis (Berg 2001). For this research a directed content analysis approach was used. The four steps followed to analyse the selected data are discussed below.

### 2.3.1. Step 1: *A priori* coding scheme themes.

Themes identified by Pirttimäki (2007) and Chee et al. (2009) in their analyses were used in the initial coding scheme:

- technology ("BI system," "information technology based systems");

- process – implementation (“implementation of BI systems”);
- product (“information and knowledge that describe the business environment,” “result (ie actionable information)”); and
- process – consumption (“process that produces insights, suggestions and recommendations,” “analysis”).

Further analysis of the definitions indicated additional themes for inclusion in the initial coding scheme:

- source (“raw data and information,” “business data which originated from various sources”)
- process – production (“analyzing”);
- user(s) of the product (“for the management and decision-makers”); and
- goal (decision-making or decisions inferred from “decision-makers”, action inferred from “actionable”).

The above themes were used as the initial coding scheme, but the researcher explicitly allowed for revision, such as the elimination of any themes that were not supported by the data in accordance with Miles and Huberman (1994), or combining or refining themes, as well as the emergence of additional themes from the inductive analysis of definitions.

### **2.3.2. Step 2: Identify coding units.**

Coding units in the definitions were identified, based on themes. When using themes as coding units, the researcher is primarily searching for the expression of ideas (Minichiello et al. 1990). In the context of this inquiry, an instance of a theme might be expressed in a single word, a phrase or even a sentence. Thus, a coding unit was defined as a string of text that expressed a theme.

### **2.3.3. Step 3: Code the text.**

Each coding unit was assigned to the most appropriate category. Whereas categories need to be mutually exclusive in quantitative content analysis, as indistinct variables would violate the assumptions of some statistical procedures (Weber 1990), qualitative content analysis allows a unit of text to be assigned to more than one category simultaneously (Tesch 1990). This is useful because assigning a particular unit of text to a single category can be complicated. However, if a coding unit does not fit any of the pre-defined themes or categories it is left unassigned. After all definitions had been coded in this manner, recurring unassigned coding units were grouped together, and a category created by identifying a word or brief phrase stating the meaning shared by all instances of the grouped coding units. Lastly, each coding unit was once again compared to the

categories to confirm that it was categorised correctly and to check coding consistency. In this research a matrix was used to record the assignment of coding units.

Although all coding units were exhaustive, that is, each definition was fully coded, the categories to which coding units were assigned were not mutually exclusive. In instances where an explicit distinction was not made as to whether the process referred to the production or consumption of the product, the coding units were reported under both categories, 'process – production' and 'process – consumption.' Similarly, when it was impossible to infer without doubt to which theme the definition referred, the coding unit was categorised in both groups. No coding units were found to categorise under 'process – implementation', and this category was eliminated. However, the categories 'source,' 'user(s)' and 'goal' were supported.

The context of the coding unit within the definition was used to determine the theme or category. This resulted in, for example, instances where "information" was listed under 'source', and "knowledge" under 'product'.

#### **2.3.4. Step 4: Describe and interpret coded data.**

Qualitative content analysis "uncovers patterns, themes, and categories" (Zhang and Wildemuth 2009). The end result was a descriptive framework of BI, based on the researcher's interpretation of the results of the coding process. This had been a purpose of the research and was thus used for reporting the results (Patton 2002). According to Zhang and Wildemuth (2009), interpretation represents the researcher's personal and theoretical understanding of the phenomenon under investigation. Thus, in addition to the descriptive framework, the researcher's interpretation was presented, together with the analysed results to allow the reader to understand the basis for the interpretation (Patton 2002).

## **2.4 TRUSTWORTHINESS**

Dependability and credibility are two methods to establish the trustworthiness of qualitative research. The coder's knowledge and experience have a significant impact on the credibility of research results (Zhang and Wildemuth 2009). One of the researchers worked as a consultant for management consulting firms, advising and implementing data warehousing and BI (DW/BI) solutions in a number of client organisations over a five-year period. She subsequently joined the academia as a lecturer, with DW/BI being one of the courses taught at postgraduate level over a seven-year period, and as such she has significant knowledge of the field. The credibility of the research results was further supported by the fact that each of the categories included in the framework is referred to in multiple definitions.

All content analysis involves the development of coding schemes or systems, that is, as an interpretive method, a subjective process. The consistency of coding is an important



feature of the dependability of the coding. Constant comparison of the coding was performed to ensure that no drift occurred, and to check for coding consistency. The coding matrix is included in [Appendix A](#) to allow the reader to judge the dependability and confirmability of the categorisation.

## 2.5. LIMITATIONS

Even though a number of measures were employed to avoid significant limitations, these were still incurred in this research. According to Mouton (2009), the limitations of content analysis include the authenticity of the data sources and the representativeness of the analysed texts, limiting the overall external validity of the results. Although these limitations apply to quantitative content analysis, it is important to note that there may also be sources of error arising from data selection effects in qualitative content analysis. In addition, Mouton (2009) states that lack of or limited information on the intentions and background of the original authors of selected texts limits interpretation. As the purpose of this research was to develop a descriptive framework encompassing different perspectives (academic, practitioner and vending,) the affiliation of the respective authors at the time of publication of the selected texts was included. Using the published affiliation of the authors as a measure of perspective is imperfect and does not fully capture the complexity of the situation, as prior affiliations may well affect the authors' perspectives. These prior affiliations are, however, not specified in most instances. However imperfect the published affiliation may be as an indication of perspective, it is used as an indicator in this research.

## 3. RESULTS

An analysis of the selected definitions supported the three complementary components of BI, namely, systems/technology, process, and product, in the definitions by Pirttimäki (2007) and Chee et al. (2009). Support was found for both the process components, encompassing the processing of data, in order to produce the information product as well as the process through which this information product is used by decision-makers. The source data is mostly internal, with some mention of external data, and mostly structured, with some unstructured. The 'goal' category was renamed to 'decision,' as this was the predominant goal found in the data. The decisions supported by BI are predominantly strategic but also tactical and/or operational, as mentioned by Pirttimäki (2007), but not Chee et al. (2009).

As can be seen in table 1, not all definitions covered all the categories, which is to be expected when using definitions with multiple viewpoints, but there was sufficient representation to warrant the following themes and categories being included in the integrated framework:



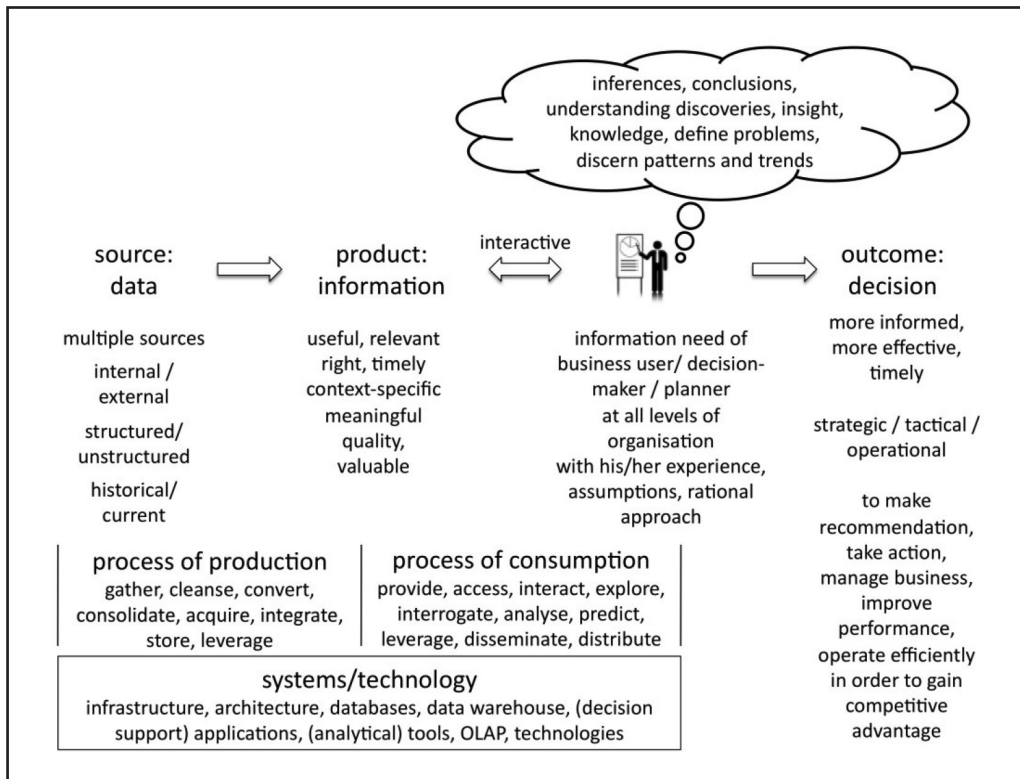
- source;
- systems/technology;
- process – consumption;
- product;
- process – production;
- user(s); and
- decision.

**Table 1:** Results of the qualitative content analysis of 27 BI definitions by affiliation and theme

	Source (%)	Tech-nology (%)	Process: produc-tion (%)	Product (%)	Process: consum-ption (%)	User(s) (%)	Decision (%)	Total (%)	Total (n)
<b>Academic</b>	83.9	62.4	91.9	59.7	75.8	46.8	83.9	46.0	12.4
<b>Practitioner</b>	37.4	44.3	79.1	68.7	79.1	25.5	79.1	35.5	9.6
<b>Vendor</b>	40.0	60.0	40.0	100.0	100.0	27.8	80.0	18.5	5
<b>Total (%)</b>	<b>59.3</b>	<b>55.6</b>	<b>77.8</b>	<b>70.4</b>	<b>81.5</b>	<b>66.7</b>	<b>81.5</b>	<b>100.0</b>	<b>27</b>
<b>Total (n)</b>	<b>16</b>	<b>15</b>	<b>21</b>	<b>19</b>	<b>22</b>	<b>18</b>	<b>22</b>		

Although the nature of the data was such that inferential statistics were not warranted, it was interesting to note the overarching tendencies. In all three groups’ definitions the process of consumption, outcome and decisions, were mentioned more often, relative to other categories, with technology mentioned less frequently, relative to other categories. Vendors included reference to technology less relative to the product, the process of consuming the product and the outcome and decision, perhaps as a result of earlier literature reporting this emphasis and/or as a result of a greater emphasis on the solution provided by the systems/technology, an emphasis that their clients were understandably most concerned about.

The themes and their relationship to each other can be depicted as a BI descriptive framework, as indicated in figure 1. The framework is depicted diagrammatically to support both researchers and practitioners, as discussed by Kosaka (2004). Coding units from the definitions were included for each theme as descriptors for use in future qualitative research.



**Figure 1:** BI descriptive framework of themes and categories with descriptors

At first glance, the descriptive framework may at first glance appear to make only a trivial contribution due to its similarity to many diagrams depicting BI architecture in vendor literature. A key distinction, however, is that instead of the technology playing a central role as in BI architectures, in this framework, technology and systems are enablers, providing the user(s) with much needed information to make decisions. Moreover, neither Dresner’s nor Luhn’s much earlier definitions contradict the framework according to which BI supports users in order to make more effective, timely, and/ or informed decisions to gain (or maintain) competitive advantage in the marketplace through the effective deployment of organisational processes and systems/technology to transform data sources into suitable information that can be interactively consumed. In the next section, the implications and limitations of the selected definitions and thus of the descriptive framework will be discussed.

## 4. DISCUSSION

There are two fundamental areas about which organisations need information for informed decisions, namely, firstly, the competitive environment, and secondly, the

organisational resources and capabilities already controlled by the enterprise (Lin et al. 1993). As mentioned in the Introduction, confusion arises when specific components are emphasized in a particular definition of BI. Another source of confusion in the literature focuses on the difference — or lack thereof — between BI and competitiveness (Lin et al. 1999 and Jourdan et al. 2008), while others regard BI and CI as two separate but related concepts (Fleisher 2003), with a third group regarding CI as a subset of BI (Foley and Guillemette 2010; Negash and Gray 2008; Pirttimäki 2007; Keyes 2006).

Lönnqvist and Pirttimäki (2006) argued that North American literature uses CI to emphasise the external environment and external sources, whereas in European literature, BI is considered an umbrella concept that includes CI and other intelligence-related terms (e.g. competitor intelligence, market intelligence). The North American-focused Strategic and Competitive Intelligence Professionals (SCIP [nd]) define CI as the “necessary, ethical business discipline for decision making based on understanding the competitive environment.” Sauter and Free (2005), also North American, provided a more detailed definition of CI, as “the process of monitoring the competition or environmental factors, capturing essential measures of activity, organizing the measures, and presenting that information so that it helps decision makers detect and respond to changes in the environment before competitors.” Another North American-based author, Fleisher (2003), considered BI and CI to be separate concepts, where BI is a technologically driven process using internal data to help an organisation understand itself better. However, this apparent geographic division isn’t clear cut, as the Canadian-based Brouard (2007), for example, regarded BI and CI as synonyms.

The emphasis of CI is on external competitive data — although the use of internal data is not excluded — and a system(s) may or may not be used to process the structured, semi-structured and/or unstructured data to produce the CI product in support of decision-making (Sauter and Free 2005). According to researchers who differentiate between BI and CI, while BI has much in common with CI, it has a different emphasis. It is not primarily concerned with the gathering of predominantly unstructured environmental data, whether about the market or competitors. Although BI does not rely exclusively on internal organisational data, the external data that is incorporated, is generally sourced from partners in the value chain, not competitors or the market, and tends to be structured rather than unstructured (Ponelis 2009). One of the main reasons for separating BI and CI is that the sources and nature of the data gathered to produce BI and CI require distinctly different skill sets. A BI professional must have technical IT skills, in order to gather, cleanse, and integrate source data, a process referred to as extraction, transformation and loading (ETL), as well as database skills to design the storage of the information product for analysis. A CI professional, on the other hand, needs extensive analytical and strategic thinking skills and should be familiar with various strategic planning tools and techniques. What these professionals have in common, is extensive knowledge of the specific industry in which they operate. BI vendors focus on delivering real-time data to support organisations’ need for shorter decision cycles in ever increasingly competitive

environments. In addition, BI vendors' research and development involve incorporating semi-structured and unstructured data into their software, although there are several challenges, for example, dealing with the large variety of formats in terms of physical storage and the retrieval of information through searching (Inmon and Nesavich 2008). Such efforts increase the possibility of using BI systems and technology to support CI, as defined above, to in turn support informed decisions in organisations. Several vendors already offer automated CI gathering and text mining for analysing unstructured and semi-structured documents.

In the selected definitions, only Negash (2004) referred explicitly to “competitive information”, although one arguably needs competitive information “in order to better understand the situation of [the] business” (Golfarelli et al. 2004), and to make strategic decisions. In seven of the 27 definitions, reference is made to internal, organisational data (Kimball and Ross 2002; Okkonen et al. 2002; Golfarelli et al. 2004; Lönnqvist and Pirttimäki 2006; Oracle 2009; Ponniah 2010; Smith et al. 2010), while three also include external data in their definitions of BI (Kimball and Ross, 2002; Okkonen et al. 2002; Lönnqvist and Pirttimäki 2006). Furthermore, one definition makes a distinction between structured and unstructured data, with both included in the definition (Sabherwal and Becerra-Fernandez 2011). As such, the selected data do not overwhelmingly support the inclusion of CI as a subset of BI, but if one assumes that decision-making can require unstructured, external competitive information, constituting CI, as defined by SCIP and Sauter and Free (2005), then most of the BI definitions imply that CI is indeed included in BI. As such, the researcher concurs with the European approach that CI is a subset of BI that aims to support decision-makers by providing integrated competitive information for decision-making. Thus, the BI descriptive framework also encompasses CI. The convergence in systems and technology further supports this view.

Although systems and technology play a supporting role in providing interactive access to the information product in the descriptive framework, in most instances they do play an important role in both the processes of production and consumption. BI systems vendors' research and development focus on incorporating internal and external semi-structured and unstructured data into their software. Several vendors already offer automated CI gathering and text mining for analysing unstructured and semi-structured documents and web-based data, although several challenges remain, for example, dealing with the large variety of formats in terms of physical storage, and the retrieval of information through searching (Inmon and Nesavich 2008). The integration among systems, supporting what is viewed by some as BI and CI respectively, supports the argument for BI also including CI.

It is the need for information that drives the user to seek information (Choo 2006), and according to Leckie *et al*'s general model for the information-seeking behaviour of professionals, first published in 1996, information needs “arise out of situations pertaining to a specific task that is associated with one or more of the work roles played by the professional” (Du Preez and Fourie 2010:69). In order to ensure that BI initiatives

deliver value to an organisation and thus justify the investment, such initiatives should focus on meeting professionals' information needs (Williams and Williams 2007), as it relates to the work roles and tasks pertaining to informing decision-making for managing the business, operating efficiently, optimising business performance and gaining a competitive advantage. Only two of the selected definitions (Schiff 2008; Pirttimäki 2007) mention explicitly that BI satisfies an information need, and although one could argue that information needs are implied in the other definitions, the fundamental importance of meeting existing and anticipated information needs arising from the organisational context should not be forgotten.

Furthermore, no definition refers explicitly to sense-making, although most refer to decisions or decision-making. The focus of sense-making is “not to decide what to do, but to understand what we have just done” (Boland 2008:57). According to Boland (2008:61), “research that adopts a decision-making perspective does not discuss the sensemaking process involved in framing the decision” because the approaches of the two contradict each other (the contradiction is discussed by Boland in detail). A number of definitions refer to the users' interpretation of the information product (“define problems, draw conclusions,” “discern trends or patterns,” “discover opportunities”) by applying their “experience”, “skills” to derive “insight” and “understanding” in order to make a decision, which in essence is making sense of what happened in order to inform what needs to happen next by making a decision and taking subsequent action (or inaction, as the case may be). Both these perspectives are relevant to BI, but unless the underlying conflict can be resolved, an undertaking that falls outside the scope of this research, both aspects cannot be accommodated in the definition without being inconsistent. Given the emphasis clearly placed on decisions or decision-making in the definitions, the researchers incorporate this perspective in the derived framework, while also taking note of the role of sensemaking by the users.

## 5. CONCLUSION

A common understanding would contribute to advance the field, both academically but also in practice. The results of the qualitative content analysis suggest that there are sufficient commonalities in definitions of BI to support an integrated descriptive framework, although there are also differences, as discussed above. It is hoped that the framework developed by this research can contribute to providing a common understanding and counter the confusion — real or perceived — arising from multiple definitions found in the literature. The framework positions systems and technology as supporting or enabling provision of information to meet decision-making information needs that can be modelled, using information-seeking models, such as Leckie's (2005) general model for the information-seeking behaviour of professionals. The descriptive framework also provides researchers with categories and descriptors for use in future qualitative research. In addition to being used as a framework for qualitative research,

the BI descriptive framework can be helpful in discussing or clarifying BI course content for academia, for clarification of job descriptions in practitioner settings, and from the vendor perspective, to focus on the systems and technology required to support the data, information and decision-making processes.

Important implications of the descriptive framework with respect to CI and information needs, and limitations in the definitions, and thus the resulting descriptive framework of BI, namely the need to engage with sensemaking in future research, were also discussed. In future research, the framework and descriptors can be confirmed, expanded and refined by independent confirmation of coding, by comparing further definitions to the framework, and by using the Delphi method to consult a panel of experts.

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