Business Intelligence—Capturing an Elusive Concept

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Introduction

In their search for competitive advantage, company executives' need improved real-time knowledge with regard to their internal organization and external business environment to rapidly adapt to changing circumstances (Howson 2014). That means companies need improved business intelligence systems to deliver optimal strategic decision making. However, firms have faced increasing challenges in trying to utilize business intelligence (BI) systems to deliver effective acquisition, assimilation, and implementation of knowledge. While producing endless amounts of data, companies face challenges

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in assimilating and exploiting data in strategic decision making. In addition, previous research has examined the impact of environmental (Ebrahimi 2000; Boyd and Fulk 1996), organizational (Ramakrishnan et al. 2012; Yasai-Ardekani and Nystrom 1996; Maltz and Kohli 1996; Qiu 2008), and managerial antecedents (Cho 2006; Elbashir et al. 2011; Babbar and Rai 1993) on business intelligence. The fragmented nature of BI research, however, leads to research focused on the operational and the tactical level (Li et al. 2008; Qiu 2008; Fleisher et al. 2008). Such research flags technological changes and not only tends to emphasize best practice, but also tends to overlook the strategic dimension (Li et al. 2008; Qiu 2008; Fleisher et al. 2008).

Moreover, the extant literature is a mixture of overlapping, if not competing, concepts: environmental scanning; the Executive Information System (EIS); competitive intelligence (CI); and BI. The proliferation of such concepts fosters discrepancies between the intelligence needed and that offered, and exacerbates the challenge associated with the measurability of the added value of the intelligence. To date, there is little or no evidence confirming the usage of any intelligence process capable of providing measurable, actionable intelligence that bolsters executives' strategic decision making. To develop managerial insights from the existing business intelligence research, the present chapter reviews the existing literature on business intelligence and thereby improves our understanding of the matter.

Theoretical Foundation

The business intelligence literature is multidisciplinary in nature. The inception of BI can be traced back to environmental scanning (ES) grounded in the strategic management research (Hofer 1978), competitive intelligence dominated by the marketing discipline (Wright et al. 2009; Dishman and Calof 2008), and the EIS drawn from decision support systems pegged to information management (Singh et al. 2002; Leidner et al. 1999; Walters et al. 2003). During the 1970s and 1980s, environmental scanning dominated the field until it was overshadowed by competitive intelligence. With the advent of the

internet, research on business intelligence was built around the concepts of Executive Information System and Decision Support system, before it was replaced by the specific term BI following the suggestion of Howard Dresner in 1989.

Traditionally, environmental scanning was the first link activity through which firms could comprehend their environment and remain on top of any changes (Hambrick 1981). Because firms' actions are constrained by their external environments (Brownlie 1994), the sustainability of competitive advantage hinges on the monitoring of events occurring in the external environment. However, the information collected through environmental scanning is not valuable unless it is matched with a thorough evaluation and analysis. Consequently, the competitive intelligence research stream adopted a four-phase process (comprising planning, collection, analysis, and dissemination) to identify, examine, evaluate, and communicate intelligence to decision makers (Wright et al. 2009; Dishman and Calof 2008). Nevertheless, both environmental scanning and CI schools of thought overlooked the internal analysis of a firm. The external environment, with its opportunities and threats, captivated scholars of both streams and overshadowed the appraisal of firms' internal strengths and weaknesses. Upon the emergence of the EIS in the late 1980s, executives were able to retrieve internal and external information through BI technologies that swiftly became capable of integrating large volumes of multisource data and providing intelligence for an organization's decision makers (Turban et al. 2010; Chaudhuri et al. 2011). Subsequently, BI would constitute a new research stream motivated by the development (and upgrading) of what are commonly referred to as BI applications or technologies.

Delineating the Business Intelligence Concept

Based on the selected literature, Table 1 provides a summary of the definitions associated with each concept. Though such concepts are considered separately within the collected literature, addressing the complementarity between the four strands of research is a sound contribution of this chapter.

Table 1 Definitions of the four concepts of BI

Concept	Definition	Authors
Environmental scanning	The *acquisition of information* regarding the happenings in the external environment of a firm.	Lau et al. (2012), May et al. (2000), Wei and Lee (2004), Fabbe-Costes et al. (2014), Ebrahimi (2000) and Cho (2006)
Competitive intelligence	A *process of* intelligence creation involving planning, information collection, analysis, and dissemination of intelligence which is the *product* that CI represents.	Calof and Wright (2008), Liu and Wang (2008), Fleisher (2008), Xu et al. (2011), Mariadoss et al. (2014) and Fleisher et al. (2008).
Business intelligence	A *process* that transforms internal and external data into knowledge and communicates it to the business user via a set of *applications.*	Ramakrishnan et al. (2012), Cheung and Li (2012), Moro et al. (2015), Elbashir et al. (2011), Popovič et al. (2012) and Zheng et al. (2012)
Executive information System	A *computerized system* that provides data access and analysis capabilities to executives.	Singh et al. (2002), Leidner et al. (1999) and Walters et al. (2003)

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Environmental Scanning

The available definitions illustrate a shared conceptual meaning regarding the nature of environmental scanning as an activity that ends once the external information (i.e., on the market, competitors, customers, suppliers) has been collected. The purpose of this concept—also known as peripheral sensing or peripheral vision—is to assist executives to proactively scan a rapidly shifting environment (Lau et al. 2012; Wei and Lee 2004; Cho 2006; Fabbe-Costes et al. 2014). However, the lack of a comprehensive framework to effectively depict shifts at the periphery combined with the bounded rationality of executives renders

environmental scanning a complex task (Haeckel 2004; Fabbe-Costes 2014). In the absence of a formal rational mechanism to interpret the events surrounding organizations, environmental scanning will inevitably involve a subjective evaluation influenced by executives' cognitive systems. Paradoxically, studies, herein, focused more on the influence of environmental uncertainty on executives scanning behavior, rather than the factors explaining and regulating such uncertainty (Haeckel 2004; Fabbe-Costes 2014). On the other hand, environmental scanning was repeatedly presented as an activity generating information appropriate for input into the strategy formulation or decision-making process (Lau et al. 2012; May et al. 2000; Wei and Lee 2004; Ebrahimi 2000; Cho 2006; Fabbe-Costes 2014). Notwithstanding its paramount importance, environmental scanning is not apt when reality sets in, for piles of data lacking appropriate analysis are undoubtedly unhelpful. To date, environmental scanning is yet to be associated with proper analysis heuristics that ensures data manipulation to deliver enhanced real-time decision making (O'Reilly and Tushman 2002; Brown 2004).

Competitive Intelligence

A look at the CI literature reveals a multifaceted concept rooted in environmental scanning (Calof and Wright 2008). Albeit eclectic, the definitions of CI distinguish between two research streams: CI as a product and CI as a process. The former regards CI as the intelligence product or knowledge relating to both the remote and task environment delivered to the business user (Slater and Narver 2000; Zheng et al. 2012; Xu et al. 2011); the latter considers it as a sequential activity through which intelligence is funneled to support organizational objectives (Wright et al. 2009; Dishman and Calof 2008; Liu and Wang 2008; Fleisher 2008). In reality, such distinctions merely benefit the researchers' purpose. If viewed as a product, the generation of ready-to-use CI, from open or human sources, becomes the center of the debate; if viewed as a process, attention shifts toward the transformation of acquired information into usable intelligence. As such, this research stream stresses the necessity of analysis; yet, for the most part, it remains prescriptive.

Executive Information Systems

The computerized decision support system (DSS) that CI analysts use to collate the intelligence requested by executives prompted the design of an EIS to retrieve information on internal operations and the business environment (Leidner and Elam 1993). That said, the definitions of EIS found in the literature reveal a consensus among scholars vis-à-vis the nature and purpose of the DSS that ensures a two-way flow of information from subordinates to executives and vice versa, via a cross-organizational-integrated technology and customized user interfaces (Volonino et al. 1995; Belcher and Watson 1993; Walters et al. 2003). This system supports executive decision making with multisource data in a textual, graphical, or tabulated format through a user-friendly interface. This research seems focused on the EIS's graphical display and rapid access to consolidated external and internal data as opposed to the EIS underpinning technology that is still deemed intricate for the executive: the sole receiver of intelligence (Walters et al. 2003; Belcher and Watson 1993).

Business Intelligence

It is worth highlighting the distinction between a system and bundle of technologies revealed by the study of the BI literature. Albeit BI technologies occupy a considerable part of the extant body of knowledge, it seems that a scholar's background—most being from the computer science or information management fields—influences the choice of perspective used to describe BI. The concept has been presented as comprising joint applications necessitating constant upgrading to overcome the challenges posed by the advent of Web 2.0 (Chen et al. 2012, 2002; Srivastava and Cooley 2003; Chung et al. 2005; Chau et al. 2007). In this context, most research appears oriented toward the technical issues related to the rising volume and complexity of data that challenges BI applications. That said, rather than evaluating the BI performance based on meeting the firm's requirements and the business users' needs (Lin et al. 2009), the common trend was the evaluation of proposed upgrades or prototypes, along with a customer satisfaction survey (Srivastava and Cooley 2003; Chung et al. 2005; Chau et al. 2007).

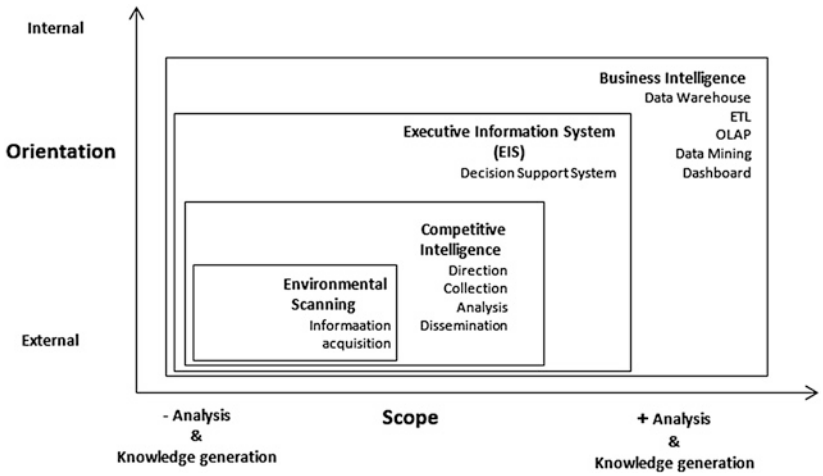

Fig. 1 BI domain (adapted from Fleisher and Bensoussan 2003, 2007)

Toward a Unified Definition of Business Intelligence

Although the foregoing literature generated overlapping concepts, there seems to be no holistic view linking the four related yet detached BI constructs. An overarching perspective on BI is illustrated in Fig. 1, where the BI domain is elucidated via two dimensions: environment and knowledge generation. The first level of BI encompasses environmental scanning externally oriented with rare analysis. This latter is part of the CI sphere and responsible for the scrutiny of the collected external information and intelligence dissemination, although it suffers from the lack of clear heuristics. On the other hand, EIS appears as the third level of BI, supporting the decision-making process with ease of access to both internal and external data. Finally, the BI concept that we introduce in this chapter is an all-embracing construct that comprises all of the above-mentioned concepts as sophisticated applications, not overlapping terms, to ensure real-time analysis and handling of multisource data to support real-time decision making.

To summarize, a careful scrutiny of the literature identified four research streams based on the conceptual approaches chosen by scholars to explore firms' BI-oriented practices, prescribe the optimal BI processes,

or dwell on the technical pitfalls and potential benefits of the BI system. Such a fragmented and operational-oriented body of knowledge draws from an overlapping set of definitions related to four concepts that form the strands of the BI research: environmental scanning, competitive intelligence, the executive information system, and business intelligence.

Hereafter, this chapter uses the four concepts listed above interchangeably to constitute a comprehensive definition of BI that embraces the interdependence between environmental scanning, CI, EIS, and BI. Accordingly, BI is defined as a system that uses computerized applications to collect, cleanse, store, and analyze internal and external data before they are transformed into substantive intelligence that is communicated to business users to support strategic and tactical decisions.

Future Outlook

Today, business intelligence provides executives with the necessary technologies (data warehousing, online analytical processing (OLAP), data mining, extract-transform-load (ETL), dashboards, and user interfaces) to access a huge volume of unstructured data in a timely manner. The optimal usage of these loads of data is left in the hands of the business user, who often feels overwhelmed by the volume of information and confused by the complexity of BI terminology, only to realize later that BI over delivers in collecting data and under delivers in answering executives' queries.

Gartner (2016) claims that the caution and skepticism around business intelligence is noticeably hampering the investment in business intelligence software that is becoming absolutely vital in the face of intensifying digitization.

It should then be no surprise that BI topped the Chief Information Officers (CIOs) priority list in the Gartner (2016) CIO agenda survey. It is a position BI has occupied for five years now and the situation seems unlikely to change anytime soon as CIOs reported; in the same survey, they expected their firms' digital revenues to increase to an average of 37% of the total revenues during the subsequent five years. If this expectation proves correct, servers will be flooded with data demanding

conversion to valuable actionable intelligence. Although this logic explains business intelligence topping a CIO's list of priorities, it draws attention to a salient aspect of this equation: the transformation of data to actionable intelligence, which in turn closes the gap between executives' expectations and reality and delivers the desired return on the investment in business intelligence technology.

Furthermore, the IDC's digital universe study 2020 revealed that the amount of data deemed useful by executives did not exceed 20%, whereas no more than 5% was actually exploited. This surprising fact points to massive volumes of data being lost every year in the digital universe that companies could have benefited from to boost their return on investment. According to a study conducted by the University of Texas at Austin, a 10% increase in the usability of data could translate to $2.01 billion of incremental revenue. Similarly, a study conducted by Brynjolfsson et al. (2011) from the Massachusetts Institute of Technology (MIT) suggests that data-driven decision-making can add 4% to an organization's productivity and 6% to its profitability. Although alarming, this correlation clearly ascribes a significant monetary value to the proper analysis of data, which to date remains by far the most significant bottleneck hindering the spread of business intelligence. This in turn engenders frustration among executives, as exemplified by only one in four respondents to a Domo and Businessintelligence.com (2013) survey stating that information in their reports met their expectations, while only 9% asserted their reports contained factual actionable intelligence.

In the midst of it all, 30 years of research turned out quantity of papers seeking new ways for optimizing technologies capable of integrating unstructured and structured data, which unless they are analyzed cannot offer support to decision makers.

Gartner (2016) estimates the business intelligence market amounted to $16.9 billion in 2016 and is predicted to grow at a steady annual rate of over 5%. Ultimately, investing in state-of-the-art technologies to elicit meaning from internal and external data is necessary for companies to succeed in today's tumultuous environment. However, if executives decide such technologies are no longer an efficient means to deliver competitive advantage, the continuous investment in updating and developing the BI arsenal will eventually cease.

Conclusion

In today's business environment, where the sustainability of competitive advantage is a moving target, room for intuition is shrinking as the need for rational predictability is growing. Data lacking proper analysis can generate no value, and sadly the International Data Corporation (IDC) predicted in 2014 that many firms will continue to waste 80% of the data they collect with the current business intelligence software. The IDC (2014) does, however, also suggest that organizations that incorporate diverse analytical tools and harvest data from a variety of sources enjoy a project success rate five times higher than firms that do not. To date, executives still face the challenge of discrepancies between needed and offered intelligence, and must address the issues surrounding the measurability of the benefits/costs associated with its implementation. This chapter argues that this state of affairs is due primarily to the choice of disparate definitions that lead to a fragmented literature, which continues to overlook strategic thinking. Despite its eclecticism, the BI research is far from exhaustive. With its roots in environmental scanning and branches in competitive intelligence, the available BI literature contributes to the enrichment of our knowledge of BI; yet it collapses under scrutiny of its strategic outcomes. This chapter, therefore, endeavors to direct scholars' attention to the strategic role BI should play to justify its cost. This chapter sheds some light on how the field is developing, and should encourage researchers to adopt an overarching view of BI that facilitates real-time decision making and strategic learning (Mintzberg and Lampel 1999) through a practical user interface.

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