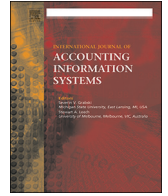


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Business intelligence & analytics in management accounting research: Status and future focus

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ABSTRACT

Executives see technology, data and analytics as a transforming force in business. Many organizations are therefore implementing business intelligence & analytics (BI&A) technologies to support reporting and decision-making. Traditionally, management accounting is the primary support for decision-making and control in an organization. As such, it has clear links to and can benefit from applying BI&A technologies. This indicates an interesting research area for accounting and AIS researchers. However, a review of the literature in top accounting and information systems journals indicates that to date, little research has focused on this link. This article reviews the literature, points to several research gaps and proposes a framework for studying the relationship between BI&A and management accounting.

1. Introduction

Business intelligence and analytics (BI&A) technologies facilitate data collection, analysis and information delivery and are designed to support decision-making. Given that management accounting (MA) is a decision-supporting activity, there is an obvious link between BI&A and management accounting (AICPA, 2013; Cokins, 2009; Maisel and Cokins, 2014). This link is important, as BI&A is high on the corporate agenda of many organizations (Colombus, 2014; Colombus, 2015; Research and Markets, 2015; PwC, 2016), and executives believe that better data analysis and decision support create value for their companies (Elbashir et al., 2013; Kiron et al., 2014). Thus, management accounting has much to gain from successfully integrating BI&A techniques into managerial accounting tasks. This interest is also reflected in the professional accounting bodies' agendas, so much so that in 2016, the Chartered Institute of Management Accountants (CIMA) called for research on 'analytics' by offering grants to undertake studies in this area (CIMA, 2016b).

Given the current business focus on BI&A and its perceived management importance, this solution domain should be an area of focus of AIS research. However, commentators have noted that although "there is potential for studying business intelligence solutions in general and their implications for decision making and control, our current understanding of these developments in the accounting academia is very limited" (Granlund, 2011, p. 10).

To assess whether these reservations are valid, an extensive literature search is carried out in over sixty accounting and information system journals. Literature reviews are essential, as they save time and effort for future researchers and lead to the efficient advancement of new knowledge and of the discipline (Webster and Watson, 2002). The specific aims of this review are twofold:

1. Critically review and evaluate the volume and content of literature that has focused on the relationship between BI&A and

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management accounting.

2. Based on the review, highlight research gaps and opportunities for future research.

This paper is structured as follows. [Section 2](#) conceptualizes the link between MA and BI&A. This is necessary, as there are numerous definitions of BI&A in use and there is some confusion regarding how this technology is linked to other emerging technologies such as big data, machine learning and the Internet-of-things. [Section 3](#) explains the two-staged literature review, initially providing a review of the recent themes in the IS literature and then giving an overview of the articles selected for the second review on the link between management accounting and BI&A. [Section 4](#) contains the review and the findings, organized into 5 themes identified during the analysis of the articles and a summary of research questions to be explored in the future. [Section 5](#) concludes the paper.

2. Conceptualizing management accounting and BI&A

Several previous literature reviews in the AIS field were examined to determine any focus on BI&A. Sutton gives an overview of AIS research and its focus areas based on articles published in the International Journal of Accounting Information Systems (Sutton, 2000, 2010). This review lists four areas of AIS research: enterprise systems, the value of IT, computer auditing and knowledge systems. BI&A is not listed as a separate area in this review. Poston and Grabski (2000) and Ferguson and Seow (2011) provide an overview of the AIS research published in various journals. These reviews do not address BI&A specifically but include “Judgment and decision-making”, “Databases”, and “Expert systems, artificial intelligence and decision-aids” as separate topics that contain BI&A-related themes. There is no specific reference to management accounting, and there is no theoretical framework developed to classify the research reviewed into a coherent framework like those developed by Mauldin and Ruchala (1999) or Hartmann and Vaassen (2003). A literature review by Rom and Rohde (2007) does this by specifically focusing on management accounting and integrated information systems, although BI&A technology is not a part of that review.

In conceptualizing management accounting, 4 main elements are defined for guiding the literature review and discussing its links to BI&A (Rom and Rohde, 2007). First, there are the overall tasks of the management accounting function or what Granlund and Lukka (1998) have called the “doing” of management accounting in the everyday life of the organizational actor (Granlund and Lukka, 1998). Although these can vary, the main ones comprise planning, control, performance measurement, transaction processing, reporting and decision support (Atkinson et al., 2011; Rom and Rohde, 2007; Booth et al., 2000). Second, there are the specific management accounting techniques that are used in carrying out management accounting tasks, such as activity-based costing, balanced scorecard frameworks, volume-based allocation of costs, strategy maps, zero-based budgeting, and forecasting (Granlund and Malmi, 2002; Seal et al., 2014; Armitage et al., 2016). While MA refers to tasks and techniques, management control is much broader and includes other controls such as personal and clan controls in addition to MA practices to achieve a certain goal (Chenhall, 2003). The third is the organization of management accounting, which includes the roles of the management accountants in organizations and how management accounting functions are organized across industries, cultures and organizational types (Quattrone and Hopper, 2005; Williams and Seaman, 2001). Finally, there is the impact management accounting has on organizational behaviour and management's perception of management accounting issues (Dechow and Mouritsen, 2005; Janke et al., 2014; Long, 2012).

Research has long investigated the impact of various information technologies on all four elements. For example, a stream of research has focussed on how the adoption of ERP systems (or integrated information systems) affect management accounting tasks and techniques. Although these systems have no doubt increased the efficiency of collecting and reporting accounting data (Cooper and Kaplan, 1997; Davenport, 1998), many have concluded that they often have stabilising effects on management accounting practices rather than engendering any direct or significant changes (Granlund and Malmi, 2002; Rom and Rohde, 2007; Scapens and Jazayeri, 2003). Nevertheless, ERP systems enable better control (Chapman and Kihn, 2009; Granlund and Malmi, 2002; Rom and Rohde, 2007; Scapens and Jazayeri, 2003; Wagner et al., 2011) and affect organizational performance positively (e.g., Hunton et al., 2003; Nicolaou, 2004; Nicolaou and Bhattacharya, 2006; Velcu, 2007). Also, studies have looked at the changing role of the management accountant because of the digitization of accounting processes. While management accountants' roles have become more business-oriented and strategic, almost consultant-like (Granlund and Malmi, 2002; Quattrone and Hopper (2001)), better access to information has led to the decentralization of the management accounting function, where management accounting tasks are increasingly performed in other functions of an organization (Caglio, 2003; Rom and Rohde, 2007).

BI&A is defined here as a technology and a process for analysing data and presenting actionable information to help organizational decision makers make better decisions (Chaudhuri et al., 2011; Howson, 2007; Davenport, 2006, 2010, 2013, 2014; Sharda et al., 2014). BI&A is an “umbrella term” in that it encompasses a variety of technologies and methodologies that enable organizations to collect data from internal and external sources, prepare it for analysis, develop and run queries against the data, and create reports, dashboards and data visualizations to make the results available to end users. In this paper, we adopt the definition of Chen et al. (2012) for BI&A, which among others, includes emerging areas in analytics such as the analytics for mobile and sensor-based content and, more generally, big data (Chen et al., 2012).

Based on the technical literature of several leading BI&A vendors (Gartner, 2017), there are four basic technological elements of BI&A applications in any organization (Chae and Olson, 2013; Chaudhuri et al., 2011; Elliot and Woodward, 2015; Howson, 2007, 2013; Howson and Arnold, 2013; Sheikh, 2013; Troyansky et al., 2015; Volitich and Ruppert, 2012). These are (i) Infrastructure (e.g., cloud-based infrastructure relational or non-SQL databases); (ii) Data management (e.g., integration of internal and external data); (iii) Data analyses (e.g., statistical techniques and artificial intelligence); and (iv) Information Delivery (e.g., dashboards). These elements are integrated, meaning that without infrastructure, data cannot be effectively and efficiently captured and stored; without

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