

Impact of Organizational strategy in Value Creation from Business Analytics System

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Business analytics systems can potentially contribute to firm performance and create competitive advantage. However, these benefits do not always follow from investment in business analytics technology. This paper argues that dynamic capabilities, enabled by business analytics technology, lead to value-creating actions and ultimately to improved firm performance. We develop a theoretical model that explains how organizational strategy relates to both business analytics technology and organizational structure, and impacts value-creating actions.

Key Words: Business Analytics, Value creating Actions, Dynamic Capabilities, Organizational Structure.

Introduction

Business analytics systems can potentially contribute to firm performance and create competitive advantage (Davenport and Harris 2007). A number of case studies describe business analytics applications and speculate about how they might contribute to firm performance (Carte et al. 2005, Davenport and Harris 2007, Kohavi et al. 2002, Piccolo and Watson 2008). However, there are few studies that clearly articulate a theoretically grounded model that explains how use of business analytics systems leads to improved firm performance (Sharma et al. 2010, Shanks et al. 2010). In this paper we extend the work of Sharma et al. (2010) and Shanks et al. (2010), and focus on how organizational strategy impacts the creation of value from business analytics systems. Research on this topic is important for two reasons. First, business analytics systems are becoming an important strategic investment for many firms. Organizations are investing large amounts of money in business analytics systems (AMR Research 2008) and ‘business intelligence applications’ was the most important technical priority and ‘increasing the use of information and analytics’ was the eighth most important business priority for Chief Information Officers (Gartner 2008). Second, although much is known about how enterprise-wide information systems bring benefits to organizations (for example Gattiker and Goodhue 2005, Seddon et al. 2010), this does not generalize to business analytics systems. The benefits of enterprise-wide information systems are often felt enterprise-wide and rely on process standardization and optimization. In contrast the benefits from business analytics systems are distributed throughout organizations, rely on entrepreneurial activities in local contexts, and are incremental in nature (Sharma et al. 2010). Prior literature on deriving business value from information technology investments has argued that information technology assets, such as business analytics systems, do not directly lead to business benefits. Rather, benefits are achieved in conjunction with other organizational and human capabilities (Aral and Weill 2007, Deveraj and Kholi 2003). However, much of this literature explores the relationship between information technology capabilities and firm performance, ignoring the key role that managers play in creating value through identifying opportunities, orchestrating assets and taking actions (Helfat et al. 2007, Teece et al. 1997). The concept of dynamic capabilities addresses this limitation and focuses on the role of managers and other decision-makers in creating value from business analytics technology.

In this paper, we combine insights from both the dynamic capabilities literature and the information technology strategy literature (Ross et al. 2006) to generate a theoretical framework that explains how dynamic capabilities, enabled by business analytics technology, lead to value-creating actions and ultimately to improved firm performance (Wade and Hulland 2004, Nevo and Wade 2010). We focus particularly on how organizational strategy influences both business analytics technology and organizational structure, and impacts value-creating actions. We demonstrate the usefulness of the framework in explaining how a

business analytics system leads to value-creating actions for one type of organizational strategy. The theoretical framework will be of value to researchers and practitioners as it extends existing work and emphasizes the role of managerial decision-making and agency in creating value from business analytics systems.

The paper is organized as follows. We first discuss the background to the study, focusing on business analytics systems and their impact within organizations. We then describe the theoretical framework, and develop two propositions that relate business analytic technology and organizational structure to value-creating actions.

We argue that the strategy impacts both business analytics technology and organizational structure, and therefore value-creating actions. Finally implications of the theoretical model for practice and future research are discussed.

Business Analytics Systems

Business analytics systems enable managers and other decision-makers to interpret organizational data to improve decision-making and optimize business processes (Watson and Wixom 2007). The use of data to support decision-making is consistent with management theorists who argue for the use of ‘evidence-based management’ in business (Davenport and Harris 2007, Pfeffer and Sutton 2006). Business analytics technology includes data warehouses and data marts, on-line analytical processing, visualization, and data mining. This technology has matured over the last decade and its use is now widespread in business analytics applications (Davenport and Harris 2007). Many case studies of business analytics applications and how they have impacted firm performance have been reported (Davenport and Harris 2007, Kohavi et al. 2002, Wixom and Watson 2001). These include applications in marketing, finance, human resources and manufacturing (Kohavi et al. 2002, Davenport and Harris 2007). Some of the mechanisms through which business analytics systems have achieved improved firm performance include:

- Quick identification of emerging trends in revenue prediction by Hewlett-Packard enabling prompt action (Davenport and Harris 2007)
- Accurate costing and pricing of products and services, and accurate assessment of customer profitability by Royal Bank of Canada (Davenport and Harris (2007)
- Accurate estimate of customer’s future value (Piccoli and Watson 2008)
- Analysis of customer data to design more effective marketing campaigns (Kohavi et al. 2002)
- Identify of ‘best value’ inventory items to drive sales of items with better fill rates, and reduce inventory (Carte et al. 2005)

Four insights may be inferred from the published case studies of business analytics (Sharma et al. 2010):

- Exploitation of business analytics systems is dispersed throughout organizations involving multiple users from many functional areas;
- Value creating actions are essential for obtaining performance gains: business analytics systems are enablers of these actions;
- Value creating actions and performance gains are often the outcomes of entrepreneurial activities in a local context; they are rarely planned or predicted;
- The impact of value-creating actions enabled by business analytics systems is incremental rather than radical and therefore different than with other enterprise-wide initiatives, such as enterprise resource planning systems.

Although these case studies highlight the potential of business analytics applications to improve firm performance, they do not provide theoretical explanations as to how and why the

value-creating actions were achieved. Recent theoretical developments in dynamic capabilities and the role of managers and decision-makers in creating organizational value provide a means of explaining how and why organizations can achieve benefits with business analytics systems. The dynamic capabilities literature places managerial agency at the heart of the theory of how organizational resources generate improved firm performance (Helfat et al. 2007). This perspective is particularly suited to business analytics systems as they deliver value from a stream of innovations over a period of time (Kohli 2007).

Another important influence on business analytics systems is strategy, operationalised as enterprise architecture (Ross et al. 2006). This view of strategy is based on the level of standardization and integration of organizational processes and data, and influences business analytics technology and organizational structure (Shanks et al. 2010). We combine strategy with insights from the dynamic capabilities perspective to develop a comprehensive framework for understanding how business analytics systems lead to value-creating actions and ultimately to improved firm performance.

Theoretical Framework

The theoretical framework is based on the resource-based view of the firm (Barney 1991, Wade & Hulland 2004) and the work of Sharma et al. (2010) and Shanks et al. (2010).

The resource-based view proposes that organizational resources are the basis for improved firm performance. Organizational resources may be tangible or intangible, and comprise organizational, human and technical capabilities. To be of strategic importance, resources must possess certain properties, viz. valuable, rare, and inimitable and non-substitutability (Barney 1991, Nevo and Wade 2010). In this paper we focus on dynamic capabilities rather than operational capabilities, as we are interested in how business analytics systems enable managers and decision-makers to undertake value-creating actions that improve firm performance. We also focus on the distributed and entrepreneurial actions taken by managers and decision-makers.

Our theoretical framework is shown below in Figure 1, where our core argument is as follows. First, given inter-firm heterogeneity and intra-firm heterogeneity (which seems highly likely), the extent of dynamic business analytics capabilities will differ across business units within organizations and across competing organizations (Sharma et al. 2010). Within this context, dynamic business analytics capabilities (routines for identifying needs and opportunities and allocating resources for them) lead to the initiation of value-creating actions. Value-creating actions then affect firm performance. Therefore, value-creating actions mediate the relationship between business analytics resources and firm performance (Sharma et al. 2010).

Figure 1. Theoretical Framework

In addition to the above three constructs, in this paper we extend our core argument and argue that three additional constructs—Organizational structure, Business Analytics Technology Quality, and the organization's Strategy—are likely to have an important influence on the extent to which business analytics capabilities lead to value-creating actions and ultimately to improved firm performance (the extension is within the dashed line in Figure 1). First, we argue that organizational structure (the level of autonomy and independence of business units) will impact managerial agency and the successful deployment of value-creating actions (Gavetti 2005, Sharma et al. 2010). Second, we argue that business analytics technology quality (software systems and data) will moderate the ability of dynamic business analytics capabilities to initiate value-creating actions (Shanks et al. 2010). Finally, we include the categorical construct, Strategy, based on the work of Ross et al. (2006). Ross et al. (2006) define four types of strategy, based on the level of standardization and integration of organizational processes and data.

We argue that each type will impact business analytics technology and organizational structure differently. Each of the six concepts in Figure 1, and their relationships, is now discussed further in detail.

3.1.1 Dynamic Business Analytics Capabilities

Dynamic capabilities are defined as “the capacity of an organization to purposefully create, extend or modify its resource base” (Helfat et al. 2007, p1-4). The key role of dynamic capabilities is to enable organizations to change the way they do things (Helfat et al. 2007). In particular, we argue that an organization’s ability to undertake value-creating actions from the use of business analytics systems depends on its dynamic business analytics capabilities. Dynamic business analytics capabilities are a specific dynamic capability that utilizes data to develop resource and implement value-creating actions (Sharma et al. 2010). Two organizational routines search and select and asset orchestration are critical for the operation of dynamic capabilities. Search processes involve identification of a need or opportunity, while selection processes involve formulating actions and allocating resources. Search and selection processes may include designing new business models, selecting configurations of co-specialized assets, selecting investments and courses of action to invest in, and selecting organizational, governance and incentive structures (Helfat et al. 2007). Asset orchestration is the ability to put search and select decisions into effect by implementing new combinations and co-alignment of assets (Teece 2009). Business analytics skills enable managers and decision-makers to effectively use business analytics technology.

3.1.2 Value-creating Actions

Value-creating actions are essential for business analytics systems to contribute to firm performance (Sambamurthy et al. 2003, Sharma et al. 2010). Having dynamic business analytics capabilities and business analytics systems alone is insufficient. It is important to recognize the key role that managers and decision-makers have in taking actions after opportunities are identified and assets orchestrated.

For example, using insight gained from analyzing data, an organization might launch new products, develop new products, introduce differential pricing, or create new channels for customer interaction (Davenport and Harris 2007, Kohavi et al. 2007, Sharma et al. 2010). It is these value-creating actions that drive firm performance.

3.1.3 Firm Performance

Firm performance is a much-studied topic. A variety of different performance measures exist including “productivity, consumer welfare, accounting profit, market valuation and operational performance” (Aral and Weill 2007, p771). In the context of business analytics systems, firm performance might be assessed in terms of firm profitability (net margin and return on investment), competitive advantage (an organization’s ability to make above average profits within a given industry sector) and/or innovation (revenues from new and modified products) (Davenport and Harris 2007, Aral and Weill 2007). Specific measures will depend on the nature of the business analytics-driven initiatives undertaken within the organization.

3.1.4 Business Analytics Technology

Business analytics technology is the hardware and software tools in which organizations invest, as well as the data stored in their information systems (Davenport and Harris 2007). The hardware and software tools include special purpose hardware (for example Teradata hardware), software tools including report generators, on-line analytical processing (OLAP) tools, statistical analysis packages and data mining tools (Watson and Wixom 2007). The data stored and used in business analytics systems should be of high quality (Price and Shanks 2007). Business analytics technology assets provide a platform from which value-creating actions may be launched. This is consistent with Sambamurthy et al. (2003) who regard information technology assets as a generator of ‘digital options’, and Nevo and Wade (2010)

who argues that synergistic information technology assets and capabilities are needed to realise business value. In Figure 1, we argue that the availability of high quality business analytics technology (data, software and hardware) is likely to make dynamic business analytics capabilities (particularly search and selection) more effective, resulting in a positive effect (greater number, more novel and more complex actions) on the value creating actions that the organizations undertake. This argument is summarized in the following proposition:

P1: Business Analytics Technology will moderate the effect of Dynamic Business Analytics Capabilities on Value-creating Actions (number, novelty and complexity).

3.1.5 Organizational Structure

Organizational structure also plays an important role in the ability of managers and decision makers to initiate value-creating actions. Value-creating actions are initiated through an interaction between the cognition of local managers and those of corporate management (Gavetti 2005). In organizations where central management strongly control the strategies and actions of business units, the cognitions of corporate management play a more dominant role than the cognitions of business unit managers (Sharma et al. 2010) in the choice and execution of value-creating actions? In particular, two key aspects of organizational structure that affect the taking of value-creating actions are autonomy and independence. Higher autonomy implies higher discretionary allocation of resources by business units. It is expected that such business units will be more effective at initiating value-creating actions. Furthermore, business units with low dependence on other business units will also be expected to be more effective at initiating value-creating actions (Sharma et al. 2010). This argument is summarized in the following proposition:

P2: Business units with high Autonomy and low dependence on other business units will be more effective at undertaking Value-creating Actions (number, novelty and complexity).

3.1.6 Strategy

Ross et al. (2006) argue that strategy is operationalised as the operating model a firm or business adopts, where operating models are defined in terms of the level of standardization of business processes and the level of integration of business processes in the organizational unit. Organizations with a high level of standardization tend to have similar key business processes and data across all business units, regardless of who executes the process. Organizations with a low level of standardization have very few identical key processes and data, and local innovation is encouraged and frequently observed. Organizations with a high level of integration have significant sharing of processes and data across and between key business processes and between all business units. Organizations with a low level of integration choose not to integrate processes and data across business unit boundaries. Combining two levels of standardization and two levels of integration results in four types of strategy.

We now discuss the characteristics of each type of strategy (Ross et al. 2006) and explain how they influence both business analytics technology quality and the organizational structure.

- *Unification:* (high standardization and high integration). In this operating model organizations have shared process and data, business units are tightly coupled and management is highly centralized. This will lead to business units that have low autonomy as managers and decision makers will need to obtain central approval for actions. Furthermore, business units will have low independence as they are tightly coupled with other business units. Standardized and integrated data will be of high quality for use in business analytics applications. Business analytics software and hardware will be shared amongst business units and hence well understood and supported.

- *Coordination:* (low standardization and high integration). Organizations with this operating model have shared customers but business units are autonomous. Data is shared but

processes are designed within business units. This will lead to business units that have high autonomy and high independence, as processes are defined within each business unit. Although data will be integrated, as it is not standardized it will be difficult to maintain high quality data. However the integrated data will provide opportunities for leveraging existing customers across business units. Business analytics hardware and software may be different in each business unit.

- *Replication*: (high standardization and low integration). In his operating model, processes and data are standardized and centrally controlled, but data is not shared. Business units are highly autonomous, but operate in a similar way. This will lead to high autonomy in business units as although operational processes are standardized, local value-creating actions may be taken. Business units will have high independence as they are loosely coupled with other business units. Data within business units may be of high quality and although not integrated, as data is standardized, integrating organizational data should not be difficult. Business analytics software and hardware will be shared amongst business units and hence well understood and supported.

- *Diversification*: (low standardization and low integration). In the diversification operating model there is no need for integration of data and processes, and business units have their own autonomous management and decision-making structures. This will lead to business units with high autonomy and high independence. Data within business units may not be of high quality and integrating organizational data will be difficult, as it is not standardized. Understanding the particular strategy in an organization (or organizational unit), together with propositions one and two, is therefore useful in explaining how and why business analytics technology may lead to value-creating actions and ultimately to improved firm performance.

Conclusion

We have argued that dynamic business analytics capabilities provide a means of understanding how and why business analytics technology may lead to value-creating actions and ultimately to improved firm performance. Furthermore, we argued that organizational strategy impacts both business analytics technology quality and organizational structure, and also value-creating actions. We need to examine the power and usefulness of the theoretical framework in explaining how business analytics systems contribute to value-creating actions and ultimately to improved performance in organizations with all four types of strategy models. We also need to undertake longitudinal case studies to understand better how value-creating actions lead to improved firm performance.

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