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## Creating Value from Business Analytics Systems: A Process-oriented Theoretical Framework and Case Study

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### Abstract

*Business analytics can potentially create value and improve competitive advantage for firms. We argue that dynamic and operational capabilities, enabled by business analytics technology, lead to improved firm performance. We develop a process-oriented theoretical framework that explains how dynamic and operational capabilities interact over time to create value. We use the framework to explain how business value was achieved from business analytics systems in a case study at a financial institution. A number of implications of the study are discussed and suggestions for future work are provided.*

### Keywords

Business analytics, resource-based view, dynamic capabilities, managerial action, value.

### INTRODUCTION

Investments in information technology (IT) have been shown to support and strengthen the efficiency of business processes and improve firm performance (Aral and Weill 2007). There has been considerable recent interest in the use of business analytics systems in providing value to organisations (Davenport and Harris 2007). Business analytics (BA) systems support decision-making and involve the structuring, storage and use of large amounts of high quality data, typically in a data warehouse. Decision-makers use comprehensive reporting, dash-boarding and online analytics processing (OLAP) technologies to improve and enhance their decision-making capabilities.

BA systems can provide value to organisations by enabling improvement of business processes, firm performance and creating competitive advantage (Davenport and Harris 2007). Several case studies have discussed BA systems and reported performance gains (Davenport and Harris 2007; Carte et al. 2005; Hamm 2009; Kohavi et al. 2002; Piccoli and Watson 2008). Similarly, industry reports have also discussed the value achieved from BA systems (Ellis 2009; Williams and Williams 2006). However, despite the significant empirical evidence that BA systems provide organisational value, few studies provide a sound theoretical basis for understanding of how and why this value is achieved.

In this study we adopt the resource-based view (RBV) of the firm as our underlying theoretical base (Barney 1991; Wade and Hulland 2004). We extend our previous work (Shanks et al. 2010) and incorporate both operational capabilities and dynamic capabilities (Helfat et al. 2007; Teece et al. 1997). We argue that operational capabilities (that are valuable, rare, inimitable and non-substitutable) lead to organisational value and increased competitive advantage. Dynamic capabilities enable organisations to change the way they do things in turbulent environments (Helfat et al. 2007). Dynamic capabilities lead to managerial actions that improve and enhance operational capabilities. By using both dynamic capabilities and operational capabilities we can explain how and why the actions taken by managers lead to changes in the resource base of organisations and hence lead to organisational value and competitive advantage.

We also adopt an evolutionary process approach and conceptualise the actions resulting from dynamic capabilities as events that change operational capabilities. In this way our understanding is based on the evolution of operational capabilities enabled by BA systems (Arnott 2004; Van de Ven and Poole 1995).

There are two motivations for our research. First, there is no existing theoretical explanation of how BA systems lead to organisational value and competitive advantage. We believe that the development of a theoretical framework is important for both practitioners and researchers working in BA. Second, much of the existing research on RBV and dynamic capabilities uses variance models (Pavlou and El Sawy 2006). In contrast we propose a process-oriented framework that emphasizes the entrepreneurial actions of managers (Sambamurthy et al. 2003; Shanks and Sharma 2011) and explains how these actions lead to changes in operational capabilities that in turn lead to organisational value. We therefore contribute to the BA literature by building a theoretical framework that explains how business analytics may lead to value and extend the strategic management literature with an evolutionary perspective on the transformation of operational capabilities.

Understanding how BA systems lead to organisational value is important for several reasons. First, BA systems become an important strategic investment for many firms. Organisations made large investments in BA systems (AMR Research 2008). Further '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 value to organisations (Gattiker and Goodhue 2005; Seddon et al. 2010), this does not apply to BA systems. The value provided by enterprise-wide information systems is enterprise-level and relies on process standardization and optimization. In contrast the value from BA systems is distributed throughout organisations, is evolutionary in nature and relies on entrepreneurial managerial actions (Shanks and Sharma 2011).

The paper is organized as follows. We first discuss the background to the study, focusing on BA systems and their impact within organisations. We then discuss RBV and capabilities. Next we describe our theoretical framework and discuss how it explains the process of achieving value with BA systems. In the following section we present a case study of BA systems within an organisation in the financial sector and use the theoretical framework to explain how value is achieved from the use of BA systems. Next we discuss the implications of the framework for research and practice and then conclude the paper with some suggestions for future work.

## **CREATING VALUE FROM BUSINESS ANALYTICS SYSTEMS**

We focus on two key areas of the literature. First we discuss the value organisations achieved with BA systems. Then we discuss operational and dynamic capabilities and explain why they are particularly relevant when explaining how value is achieved with BA systems.

### **Business Analytics Systems and Value**

We define BA technology to include data warehouses and data marts, dashboards and reporting, on-line analytical processing, visualisation, and data mining. This technology has matured over the last decade from early attempts to plan and implement data warehouses to its current widespread use in many organisations (Watson and Wixom 2007). BA systems enable managers and other decision-makers to interpret organisational data to improve decision-making and optimise 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).

Several published case studies report the value enabled by the use of BA systems (Allmendinger and Lombreglia 2005; Davenport and Harris 2007; Kohavi et al. 2002). Typical BA systems that enable value include marketing applications that reduce customer attrition, increase customer profitability and increase the response rates of marketing campaigns (Kohavi et al. 2002). Other applications of BA include manufacturing and production planning for order delivery (Kohavi et al. 2002), remote diagnostics and replenishment (Allmendinger and Lombreglia 2005). Other success stories are from the finance, human resources and research and development industry sectors (Davenport and Harris 2007). Some examples with BA analytics and value-derived mechanisms (e.g. Davenport and Harris 2007; Kohavi et al. 2002) are summarised in Table 1 below.

Overall, three insights can be derived from published case studies (Shanks and Sharma 2011):

- Exploitation of BA systems is dispersed throughout organisations involving multiple users from many functional areas.
- Value is achieved through operational capabilities enabled by BA systems. These capabilities and systems are developed through a process of gradual and continuous evolution.
- New opportunities are sensed periodically and resources allocated by managers to take actions. These actions result in changes to operational capabilities and lead to further value.

Although these case studies highlight the potential of BA systems to provide value and create competitive advantage, they do not provide theoretical explanations as to how and why this occurs. We argue that it is important to conceptualize value as being achieved through operational capabilities, with BA systems enabling

those capabilities. For example, targeting particular marketing campaigns at customer segments is an operational capability that will lead to value, for example increased sales. However the use of a high quality database of customer information, together with BA technology to better segment the customers will enable that capability and should lead to increased value. Furthermore, dynamic capabilities are important in understanding how and why operational capabilities evolve and change due to managerial actions. We therefore base our theoretical framework on RBV, and the key concepts of operational and dynamic capabilities.

Table 1. Business Analytics Applications and Value

Type of analytics	Description and Mechanisms
Insurance analytics	Underwriting rate optimisation: predicting the optimal price for insurance products.
Customer analytics	Customer lifetime value: grouping customers based on high, medium, and low value and then taking actions to increase revenue. Campaign management: planning selective campaigns based on customer segmentation and likely customer behaviour. Cross-sell and Up-sell: increasing revenues by proposing other (or high-end) products.
Banking and financial services analytics	Customer segment analysis: segmenting customers into groups and targeting the groups with tailored banking products and services.
Retail and Marketing analytics	Discount or price optimisation: predicting optimal amounts for discounts and normal prices of merchandise for customers. Trend and basket analysis: analysing sales data to identify buying trends and patterns, long-term planning. Design of effective marketing campaigns and improvement of advertisement effectiveness.

### Resource-based View and Capabilities

The RBV argues that organisational resources are the basis for improved firm performance (Barney 1991; Wade and Hulland 2004). Organisational resources may be tangible or intangible, and comprise organisational, human and technical capabilities. To be of strategic importance, resources must be valuable, rare, inimitable and non-substitutable (Barney 1991). Both operational and dynamic capabilities have been proposed to explain firm performance in both static and turbulent environments.

Operational capabilities are the organisational (business processes, routines), human (people and skills) and technical (technology infrastructure and tools) capabilities necessary to achieve value and competitive advantage. Within RBV, operational capabilities are a critical determinant of firm performance (Aral and Weill 2007). Superior performance can be attributed to unique capabilities that enable organisations to perform activities more efficiently and effectively than their competitors (Amit and Schoemaker 1993).

Dynamic capabilities were conceptualized in response to the static nature of operational capabilities. Operational capabilities do not take into account changes within turbulent environments. While operational capabilities focus on 'resource picking' (i.e. selecting valuable synergistic combinations) (Barney 1991; Wade and Hulland 2004), dynamic capabilities focus on 'resource renewal' (i.e. reconfiguring existing synergistic combinations) and enhance existing and create new operational capabilities (Teece et al. 2007). Dynamic capabilities build, integrate, and reconfigure internal and external resources to address rapid changes in the environment.

While operational capabilities are conceptualized as first order constructs (they directly impact firm performance), dynamic capabilities are conceptualized as second order constructs (they change operational capabilities) (Pavlou and El Sawy 2007). In much existing work, dynamic capabilities and operational capabilities are related by causal links in variance models (Pavlou and El Sawy 2007). This approach to dynamic capabilities has been criticised as an abstract, hidden and invisible (Simonin 1999), complex and tacit (Dierickx and Cool 1989) and as a meta-routine difficult to relate to managerial practice (Collis 1994).

In this study, we follow a process-oriented perspective, and highlight the managerial actions necessary to enhance existing and create new operational capabilities, extending the work of Sambamurthy et al. (2003) and Shanks and Sharma (2011). This perspective places managerial action at the heart of our theoretical framework and provides a means of explaining how and why organisations are able to achieve value with BA systems. It is particularly relevant to BA systems as dynamic capabilities rely on real-time information in order to quickly understand situations in turbulent environments and take actions (Eisenhardt and Martin 2000).

## THEORETICAL FRAMEWORK

The theoretical framework adopts an evolutionary process theory perspective and uses continuous evolution to explain how value is achieved from BA systems (Arnott 2004; Van de Ven and Poole 1995). There are two ways that operational capabilities will change. First, operational capabilities, enabled by BA systems, will gradually change over time. These changes will be due to cognitive causal factors such as system use, analyst and peer interaction, and training (Arnott 2004). Second, dynamic capabilities, enabled by BA systems, will lead to opportunities for change and managerial actions will be initiated (Shanks and Sharma 2011). The opportunities for change will be due to environmental causal factors such as industry changes, technology changes, mergers and acquisitions and internal organisational changes (Arnott 2004). The actions will lead to changes in operational capabilities, and consequently to a change in the value achieved.

Thus, we propose a two-level theoretical framework that conceptually distinguishes dynamic capabilities from operational capabilities and argues that dynamic capabilities lead to actions that change operational capabilities. In other words, organisations use their operational capabilities (human, organisational and technical) to achieve value. However in changing and turbulent environments, the organisations will seek opportunities to renew and re-allocate resources and take managerial actions.

The theoretical framework is shown below in Figure 1. The key concepts in the framework are defined in the following sections.

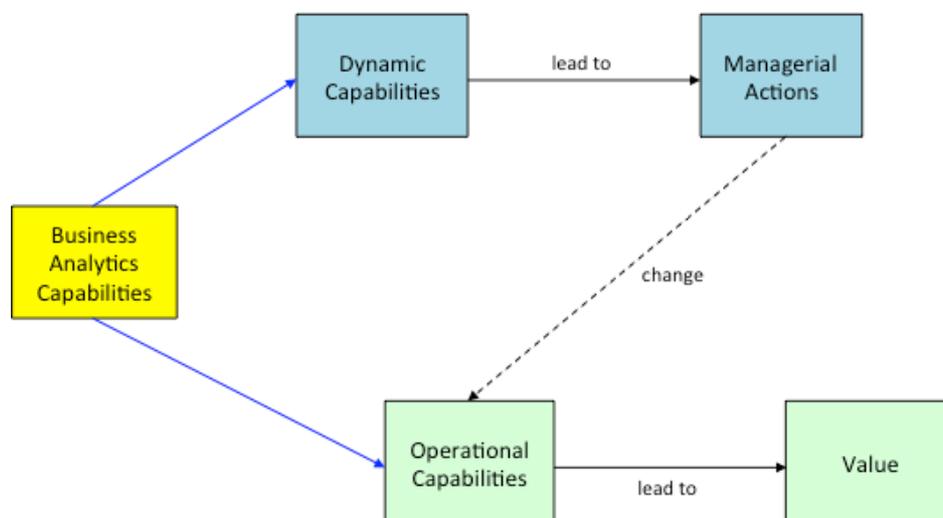


Figure 1: Theoretical Framework

### Operational Capabilities

Operational capabilities (that are valuable, rare, inimitable and non-substitutable) lead to organisational value and competitive advantage (Nevo and Wade 2010; Wade and Hulland 2004). In the context of BA systems, these capabilities can be any that require support from the use of information. For example, a marketing campaign for a product or service requires customer data to be effective and lead to value. Good quality customer data from a data warehouse that has been segmented using demographic and psychographic data will enable that operational capability and with better targeting of customers will lead to improved value. We argue that it is at the level of operational capabilities that organisational value and competitive advantage are gained.

As discussed previously, operational capabilities, enabled by BA systems, will evolve over time due to cognitive causal factors such as system use, analyst and peer interaction, and training. For example, customer segmentation capabilities will evolve as users of the BA system become more familiar with the shared data definitions of customer segmentation technology.

Operational capabilities may also be changed by a managerial action that changes an operational capability. For example, a new technology for segmentation may be implemented, changing the operational capability considerably.

### Dynamic Capabilities

Dynamic capabilities are defined as “the capacity of an organisation to purposefully create, extend or modify its resource base” (Helfat et al. 2007, p. 4). The key role of dynamic capabilities is to enable organisations to

change the way they 'do things' (Helfat et al. 2007). Following Shanks and Sharma (2011) and Baretto (2011), we conceptualize dynamic capabilities as comprising two organisational routines, *search and select* and *asset orchestration*.

*Search* processes involve identification of a business 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 organisational, governance and incentive structures (Helfat et al. 2007). Search and select routines are enabled by BA systems when opportunities for change are identified from data (Shanks and Sharma 2011).

*Asset orchestration* is the ability to put search and select decisions into effect by implementing new combinations and co-alignment of assets (Teece 2009). Asset orchestration capabilities rest on routinely enacted managerial processes to undertake change. The changes may be in the form of new products, new processes, new technology, new decision-making routines, new reporting relationships, etc. Asset orchestration often requires a high degree of coordination across business unit boundaries to undertake changes (Shanks and Sharma 2011).

### **Managerial Action**

Managerial actions are a key concept in our theoretical framework as they introduce human agency into our process model (Sambamurthy et al. 2003; Shanks and Sharma 2011). We argue that it is crucial to include explicitly those managerial actions that enact the opportunities identified within dynamic capability routines. Theories that do not include human agency, but focus on more abstract concepts, result in implications that can be difficult for managers to follow (Shanks and Sharma 2011). Managerial actions provide a means of relating dynamic capabilities with operational capabilities and resolving the issue of first-order and second-order constructs in our process model. Managerial actions are events that change operational capabilities.

### **Value**

The value achieved will depend on the particular application of the theoretical framework. Typical measures in a customer-focused BA initiative include campaign effectiveness, reduced costs, increased revenue, customer retention and improved share of wallet. Another type of value is increased competitive advantage, indicated by performance measures against competitors (Davenport and Harris 2007).

## **RESEARCH METHOD**

We use an explanatory case study research approach. Case studies are particularly useful for in-depth studies of contemporary phenomena within their organisational context (Yin 1994). They provide a rich and detailed description of the phenomena and explain how and why outcomes occur. The unit of analysis in our study was the Customer Analytics function within of a large Australian financial institution. We were provided with access to the key stakeholders involved, including senior managers within the function, BA experts, project managers, and staff who interact with others within the organisation who use the BA system.

Data collection included semi-structured interviews and access to relevant documents. Interviewees were selected using heterogeneity sampling to enable triangulation (Miles and Huberman 1994). We conducted twelve interviews with key participants (see Table 2) over a period of three months, with each interview lasting about one hour. The interview protocol was based on concepts in our theoretical framework. All interviews were recorded and transcribed. We used thematic analysis to identify common patterns and themes emerging from the data (Miles and Huberman 1994).

## **CASE STUDY**

### **Case Study Organisation**

The case study was located in a large Australian financial service institution. It provides a range of financial services including personal and business banking, wealth management and investment banking. The organisation has over 8 million personal and business customers in 10 countries. A core business strategy is to provide innovative and relationship-based financial services. It is highly customer focused and was an early adopter of Customer Relationship Management (CRM) systems. The organisation has used CRM systems for nearly two decades and makes extensive use of Teradata and Seibel technology. It has a customer analytics group of approximately 20 people located centrally within the organisational structure as part of a central marketing function. The customer analytics group is stable and mature and operates as a shared service to other parts of the organisation.

Table 2. Case Study Interviews

Roles	Interviewees
Senior Managers	General Manager Customer Analytics and Research, Head of Customer Analytics, Head of CRM and Sales Support, Manager CRM Measurement and Reporting.
BA Experts	Campaign Analyst, Design Lead, Team Leader CRM Operations and Reporting.
BA Project Managers	Delivery Manager, Project Manager, Technology Service Owner.
Business Interaction Staff	Strategic Partner of Personal Banking, Business Engagement Partner.

The use of BA within the organisation has evolved over three phases.

**Phase 1 (before 2006)** A high quality data infrastructure was developed including sophisticated technology and integrated customer data. High quality BA skills and capabilities were developed and retained. BA was used mainly for campaign management of outbound marketing activities mainly through a direct mail channel.

**Phase 2 (2006- 2009)** The focus was shifted to event-based marketing through in-bound channels, including bankers, on-line banking and call centers. BA was used mainly for retail customers but also within business banking. Sophisticated customer lifecycles models were developed that included a large number of events (triggers) that generated insights and leads for customers. A multi-step and multi-channel BA capability was developed. Metrics were developed to determine the effectiveness of leads that enabled types of events to be prioritized. Governance mechanisms were implemented to facilitate feedback and input into future initiatives.

**Phase 3 (2010- present)** A banker dashboard was implemented, enabling bankers to better understand their performance against targets and adopt a forward-looking perspective. They could then request leads generated daily by the CRM system to optimise their performance. Governance mechanism evolved to enable continuous improvement through closer engagement with product general managers.

Overall, the organisation has a sophisticated and mature customer analytics function that operates as a centrally located shared service across the whole organisation. The customer analytics group is particularly stable: many of the interviewees had been with the organisation for over 10 years. The CRM function was referred to as a “*world class capability*” by several interviewees, based on its multi-step and multi-channel capabilities. For example:

*“We’re probably years ahead of some of our competitors... some of them do a significantly larger volume of leads than we do, but they’re still doing product push, and they’re moving more towards event-based marketing.”* (Project Manager)

In this paper, we focus on how the banker dashboard and event-based triggers are used by retail bankers. We first describe how operational capabilities are enabled by BA systems and lead to organisational value. We then describe how dynamic capabilities, enabled by BA systems, lead to managerial actions that drive the evolution of operational capabilities and improved value. We argue that our theoretical framework provides a useful means of explaining how BA systems create value for organisations.

### Operational Capabilities and Value

As we are focused in this paper on retail banking, we are concerned with how the organisation interacts with individuals rather than businesses. Relevant banking products include savings accounts, term deposits, mortgages, personal loans and credit cards. It is through retaining existing customers and cross-selling additional products that value is achieved for the organisation. We focus also on the ‘banker’ channel, and so are concerned with personal interaction with customers.

There are two main mechanisms through which BA systems enable bankers to achieve value: proactive (outbound) and reactive (inbound). In both mechanisms customer data is used to generate leads using propensity modeling (predicting major events, for example house renovation) and through detection of particular events in a customer’s life cycle by analysis of transactions (e.g. “*a large deposit is made*”, and/or “*change in monthly salary*”, Manager CRM Measurement and Reporting). For outbound mechanisms, a list of leads is generated and sent to the banker for follow-up. An example is the launching of a new high interest on-line savings account. Propensity modeling using customer data generated a list of likely customers who might use the new product and the customers were contacted. Inbound mechanisms rely on relevant data being available when the customer contacts the banker. The banker provides the customer’s identity details and the CRM system responds with up-to-date information about relevant events that may provide opportunities for cross selling:

*“...giving a banker a few lines of information about a customer and getting them to be able to get into a mindset to have a conversation with a customer. So someone calls into the call centre and we pop up a message that might say ‘This customer has recently deposited X number of thousand*

*dollars into their bank account, have a chat to them about the savings product” (Business Engagement Partner).*

Inbound mechanisms are more targeted and often more effective:

*“The event based marketing is about talking to the customer when it’s the right time for the customer. Campaigns, the product based marketing is about talking to the customer when it’s the right time for us.” (Head of Customer Analytics)*

Metrics are in place to determine the effectiveness of inbound event leads, including the number that have been requested, the number of conversations in which the leads were used, the number of opportunities created from the leads and the conversion rate from the leads. These metrics are used to prioritise leads to ensure that the most useful (and profitable) insight is used by bankers.

### **Dynamic Capabilities**

Dynamic capabilities are routines for change to ensure that competitive advantage and value are maintained over time. BA systems are often used to detect new events that might present opportunities.

#### *Search and Select*

There are a number of routines for identifying and acting upon new opportunities. Monthly meetings of BA, product and marketing analysts and managers review performance and identify new opportunities. Business interaction staff encourage informal feedback from bankers (both via email and/or call centers), sometimes identifying potential new customer lifecycle events that could be included in the CRM system. BA experts also present potential data-driven opportunities at the meetings. Opportunities are prioritized ready for implementation.

An example of a significant opportunity was the banker dashboard. This was intended to provide bankers with on-line information about how they were performing in relation to their targets. This knowledge then helped them to decide which information they could request from the CRM system as inbound leads. Another example was the identification of the regular transfer of money from a savings account to another financial institution. This event could indicate a mortgage or loan opportunity.

#### *Asset Orchestration*

The developed business cases are reviewed for return on investment. Other business units fund projects. Project teams are then established using expertise from the BA group and information technology experts. The capabilities to rapidly establish a high quality team are available within the organisation.

### **Managerial Actions**

Managerial action involves the implementation into production of the new types of capabilities for bankers. It involves change management and training. For example, the banker dashboard implementation involved a six-month pilot project followed by intensive training.

### **Evolution of Operational Capabilities**

Operational capabilities evolved significantly over time. The dynamic capabilities established within the organisation have enabled regular changes to operational capabilities that have led to increasingly sophisticated use of BA systems:

*“We started on the journey of really building our stock of event based triggers that ranged from the very, very basic ... term deposit rollover, fixed rate expiry on the home loan... up to increasing levels of sophistication. We know that customers have had a mortgage for a certain period of time, we know the purchase rate, we know how much they borrowed, how much they’ve paid down, we can overlay external data to say we know the property’s gone up by 30%. We can then estimate the equity in that property and can probably give them some help and advice.” (General Manager Customer Analytics and Research).*

## **DISCUSSION**

The theoretical framework we propose for explaining value achieved with BA systems has been used to explain how value was achieved from BA systems at a large financial institution. A number of important implications emerge from the case study.

### **Evolutionary Process-oriented Perspective**

An evolutionary, process-oriented perspective is crucial in understanding how value is achieved from BA systems. The use of BA systems in the case study evolved over a long period of time, and the evolution can be seen at two levels. First, the three phases of BA use identified provide a macro-perspective. A high quality data infrastructure, strong BA technology skills, and knowledge of both the business and the technology are an important foundation for achieving business value. Success with initial outbound marketing initiatives enabled the focus to move to more sophisticated analytics, inbound event-based marketing and later to a dashboarding capability with user driven evolution of BA capabilities. This evolution is similar to the stages of maturity in business analytics identified by several researchers (e.g. Davenport and Harris 2007). This organisation has evolved to be a mature user of business analytics with CRM capabilities embedded deeply within organisational processes. Organisations may need to go through a similar evolutionary path to ensure acceptance and widespread use of BA systems.

Second, the organisation has established dynamic capabilities that enable the routine and continuous evolution of BA system use to maintain competitive advantage and provide value. This is a micro-perspective of the evolution of BA systems use. The establishment of governance and feedback mechanisms is crucial in ensuring that BA systems evolve with both business user and BA specialist input, and meet business needs.

The evolutionary process-oriented perspective that we use contrasts with many other studies based on RBV that develop variance models (Pavlou and El Sawy 2007). Variance models provide a snapshot perspective at a point in time and do not explain the underlying mechanism by which BA systems evolve and provide value. We argue that the evolutionary process-oriented perspective is ideal for research involving longitudinal case studies and is appropriate for studying BA systems, as they are examples of decision support systems, which are evolutionary in nature (Arnott 2004).

### **Importance of Operational and Dynamic Capabilities**

Clearly operational capabilities are fundamental in achieving benefits from BA systems (Wade and Hulland 2004). It is important that the BA systems are truly embedded with business processes. In the case study, BA systems were used to support banking processes and provide opportunities to provide improved service to customers. BA systems should not be seen as isolated technical solutions. Acceptance of BA systems by bankers requires evidence of value that can be attributed to the BA systems.

Dynamic capabilities are crucial to the evolution of operational capabilities supported by BA systems to meet the changing needs of users and to retain value and competitive advantage (Baretto 2011). The case study organisation had mature and embedded routines that provided dynamic capabilities including search and select and asset orchestration. The integration of operational and dynamic capabilities in our evolutionary process-oriented framework is an important contribution to RBV theory. We show clearly how the second-order construct (dynamic capabilities) leads to changes in the first-order construct (operational capabilities). Although dynamic and operational capabilities have been included together in variance models (Pavlou and El Sawy 2007), our theoretical framework explicitly shows how they are related in a process model.

### **Managerial Agency**

We include managerial actions in our theoretical framework as the link between dynamic capabilities and operational capabilities. In many studies that use RBV, organisational level characteristics influence outcomes and managerial actions are not included. For example, Pavlou and El Sawy (2007) conceptualize dynamic capabilities and operational capabilities using organisational level measures. The inclusion of managerial actions ensures that managers will find implications of the framework easier to adopt.

### **Value for Practitioners**

There are a number of insights from the theoretical framework and case study that are useful for practitioners. The framework provides a clear and systematic means of understanding how BA systems lead to value and competitive advantage. The case study provides an explanation of how BA systems may be used successfully in a mature and sophisticated customer analytics function in a financial organisation. It highlights the importance of a high quality data and mature technology infrastructure. Furthermore it highlights the importance of embedding BA systems within business processes and developing dynamic capabilities to ensure that the BA systems continuously evolve and provide increasing value. In this way BA systems may lead to competitive advantage.

## CONCLUSION

In this paper we argue that dynamic and operational capabilities, enabled by BA systems, lead to business value and improved competitive advantage. We have proposed an evolutionary, process-oriented theoretical framework to explain how value is achieved over time. We used the framework to explain how value is achieved from BA systems in a longitudinal case study of successful BA use at a financial institution. Further work is planned in using and refining the framework in explaining how value is achieved from BA systems in multiple case studies in different industry sectors.

## REFERENCES

- Allmendinger, G. and Lombreglia, R. 2005. "Four Strategies for the Age of Smart Services," *Harvard Business Review* (83:10), pp 131-145.
- Amit, R. and Schoemaker, P.J. 1993. "Strategic Assets and Organizational Rent," *Strategic Management Journal* (14:1), pp 33-46.
- AMR Research 2008. "Spending on Business Intelligence and Performance Management to Top \$57.1B in 2008." Retrieved 10 January, 2009, from <http://www.amrresearch.com/Content/View.asp?pmillid=21481>.
- Aral, S. and Weill, P. 2007. "IT Assets, Organisational Capabilities and Firm Performance: How Resource Allocations and Organisational Differences Explain Performance Variation," *Organisation Science* (18:5), pp 1-18.
- Arnott, D. 2004. "Decision Support Systems Evolution: Framework, Case Study and Research Agenda," *European Journal of Information Systems* (13:4), pp 247-259.
- Barney, J. 1991. "Firm Resources and Sustained Competitive Advantage," *Journal of Management* (17:1), pp 99-120.
- Barreto, I. 2011. "Dynamic Capabilities: A Review of Past Research and an Agenda for the Future," *Journal of Management* (36), pp 256-280.
- Carte, T., Schwarzkopf, A., Shaft, T. and Zmud, R. 2005. "Advanced Business Intelligence at Cardinal Health," *MIS Quarterly Executive* (4:4), pp 13-424.
- Collis, D.J. 1994. "How Valuable are Organizational Capabilities?" *Strategic Management Journal* (24), pp 143-152.
- Davenport, T.H. and Harris, J.G. 2007. *Competing on Analytics*. Harvard Business School Press.
- Devaraj, S. and Kohli, R. 2003. "Performance Impacts of Information Technology: Is Actual Usage the Missing Link?" *Management Science* (49:3), pp 273-289.
- Dierickx, I. and Kohli, R. 2003. "Asset Stock Accumulation and Sustainability of Competitive Advantage," *Management Science* (35:12), pp 1504-1511.
- Eisenhardt, K.M. and Martin, J.A. 2000. "Dynamic Capabilities: What Are They?" *Strategic Management Journal* (22), pp 1105-1121.
- Ellis, K. 2009. *Business Analysis Benchmark 2009: The Pass to Success*. IAG Consulting.
- Gartner 2008. "Australian and New Zealand CIOs Expect Lower Than Average IT Budget Growth in 2008," Retrieved 15 January, 2009, from <http://www.gartner.com/it/page.jsp?id=606007>.
- Gattiker, T. and Goodhue, D. 2005. "What Happens After ERP Implementation: How Interdependence and Differentiation Affect Plant Level Outcomes," *MIS Quarterly* (29:3), pp 561-587.
- Hamm, S. 2009. *IBM Roars into Business Consulting*. Business Week Online.
- Helfat, C.E., Finkelstein, S., Mitchell, W., Peteraf, M.A., Singh, H., Teece, D.J., and Winter, S.G. 2007. *Dynamic Capabilities: Understanding Strategic Change in Organisations*. Blackwell, Carlton.
- Kohavi, R., Rothleder, N., and Simoudis, E. 2002. "Emerging Trends in Business Analytics," *Communications of the ACM* (45:8), pp 45-48.
- Miles, M. and Huberman, M. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*, 2nd ed. Sage Publications.
- Nevo, S., and Wade, M.R. 2010. "The Formation and Value of IT-Enabled Resources: Antecedents and Consequences of Synergistic Relationships," *MIS Quarterly* (34:1), pp 163-183.

- Pavlou, P. A., and El Sawy, O. A. 2006. "From IT Competence to Competitive Advantage in Turbulent Environments: The Case of New Product Development," *Information Systems Research* (17:3), pp 198–227.
- Pfeffer, J. and Sutton, R. 2006. "Evidence-based Management," *Harvard Business Review* (84:1), pp 62-68.
- Piccoli, G. and Watson, R. 2008. "Profit from Customer Data by Identifying Strategic Opportunities and Adopting the 'Born Digital' Approach," *MIS Quarterly Executive* (7:3), pp 113-122.
- Sambamurthy, V., Bharadwaj, A., and Grover, V. 2003. "Shaping Agility through Digital Options: Reconceptualising the Role of Information Technology in Contemporary Firms," *MIS Quarterly* (27:2), pp 237-263.
- Seddon, P., Calvert, C. and Yang, S. 2010. "A Multi-Project Model of Key Factors Affecting Organisational Benefits from Enterprise Systems," *MIS Quarterly* (32: 2), pp 305-328.
- Shanks, G., Sharma, R., Seddon, P. and Reynolds, P. 2010. "The Impact of Strategy and Maturity on Business Analytics and Firm Performance: A Review and Research Agenda," *Proc. 21<sup>st</sup> Australasian Conference on Information Systems*, QUT, Brisbane, December.
- Shanks, G. and Sharma, R. 2011. "Creating Value from Business Analytics Systems: The Impact of Strategy," *Proc. 15<sup>th</sup> Pacific Asia Conference on Information Systems*, QUT, Brisbane, July.
- Simonin, B. L. 1999. "Ambiguity and the Process of Knowledge Transfer in Strategic Alliances," *Strategic Management Journal* (20), pp 595–623.
- Teece, D.J., Pisano, G., and Shuen, A. 1997. "Dynamic Capabilities and Strategic Management," *Strategic Management Journal* (18:7), pp 509-533.
- Teece, D.J. 2009. *Dynamic Capabilities and Strategic Management: Organizing for Innovation and Growth*. Oxford University Press, Oxford.
- Van de Ven, A.H. and Poole, M.S. 1995. "Explaining Development and Change in Organisations," *Academy of Management Review* (20), pp 510-540.
- Wade, M. and Hulland, J. 2004. "The Resource-Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research," *MIS Quarterly* (28:1), pp 107-142.
- Watson, H.J. and Wixom, B.H. 2007. "The Current State of Business Intelligence," *Computer* (40:9), pp 96-99.
- Williams, S. and Williams, N. 2006. *The Profit Impact of Business Intelligence*. Morgan Kaufmann.
- Wixom, B.H. and Watson, H.J. 2001. "An empirical investigation of the factors affecting data warehousing success," *MIS Quarterly* (25:1), pp 17-41.
- Yin R.K. 1994. *Case Study Research: Design and Methods*. Sage Publications, Thousand Oaks.

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