Creating Value With Business Analytics In The Supply Chain

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UNDERSTANDING BUSINESS ANALYTICS INNOVATIONS USING DYNAMIC CAPABILITIES: THE BAIP MODEL

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Abstract

Business analytics (BA) systems create value and provide competitive advantage for organisations. We use the resource-based view and dynamic capabilities to develop the BA innovation process (BAIP) model, which describes how BA-enabled opportunities are introduced into organisations through a series of innovation cycles. We use the BAIP model to describe how BA-enabled opportunities were selected, justified, implemented and measured through several innovation cycles in a case study of a global wireless device distribution and supply chain provider. Several themes emerge from the case study: the importance of dynamic capabilities in maintaining competitive advantage; governance mechanisms in supporting the innovation cycles; change management when implementing the innovations; organisational learning and feedback mechanisms; measures that demonstrate the effectiveness of the innovations; and alignment of the innovations with organisational strategy.

Keywords: Business Analytics, Dynamic Capabilities, Innovation, Case Study.
1 Introduction

Many organisations have made significant investments in information technology (IT) to improve the efficiency of business processes and strengthen firm performance (Aral and Weill, 2007). Recently, there has been strong interest in the use of business analytics (BA) systems to provide benefits to organisations and increase competitive advantage (Davenport and Harris, 2007; Davenport et al., 2010). BA systems include technology and data infrastructure, BA competencies, and business practices that use organisational data to provide useful insights (Davenport and Harris, 2007). BA systems support decision-making and involve structuring, storage and using large amounts of high quality data, typically from a data warehouse. Decision-makers use comprehensive reporting, dashboarding and online analytical processing (OLAP) technologies to improve and enhance their decision-making capabilities. BA systems also include the use of more sophisticated techniques for simulation, optimisation, forecasting and data mining (Davenport and Harris, 2007; Davenport et al., 2010).

A number of research case studies have explored the use of BA systems and reported performance gains (Carte et al., 2005; Kohavi et al., 2002). They also highlight the importance of embedded data-driven decision-making. Similarly, industry reports have reported significant benefits achieved from the use of BA systems (Kiron et al., 2011). Despite the compelling empirical evidence that BA systems provide organisational benefits, few studies provide a sound theoretical basis for understanding of how and why this occurs. In this paper, we develop a process model that describes how BA-enabled opportunities are introduced into organisations through a series of innovation cycles. The process model is based on dynamic capability theory (Eisenhardt and Martin, 2000; Teece et al., 1997) and the net-enabled business innovation cycle (NEBIC) model of Wheeler (2002).

There are three motivations for our research. First, BA systems are an important strategic investment for many firms (Davenport et al., 2010). Organisations have invested significantly in BA systems to create value and provide competitive advantage (Kiron et al., 2011). Business intelligence was recently ranked as the fifth most important technical priority, and the third most important business priority for CIOs (Gartner, 2010). Second, although much is known about how enterprise resource planning (ERP) systems bring benefits to organisations (Seddon et al., 2010), this does not generalise to BA systems. The benefits of ERP systems are often enterprise-level and rely on process standardisation and optimisation. In contrast, the benefits from BA systems are distributed throughout organisations, are evolutionary in nature and rely on local entrepreneurial managerial actions (Shanks and Bekmamedova, 2012). Third, currently there is no theoretical base to describe how and why BA systems bring value to organisations. In particular, we develop a process theory that captures the dynamics of innovation with BA systems, providing a base for future research and practical guidance.

The paper is organised as follows. We first discuss the background of the study, including BA systems and how they bring benefits to organisations, the resource-based view (RBV) of the firm, dynamic capabilities, and NEBIC. We then describe the BA innovation process (BAIP) model. Following that we discuss the case study research methodology used. We then present a case study of the use of BA systems within a large supply chain service provider and use the BAIP model to describe how BA-enabled innovations were introduced into the organisation. Next we discuss some important themes that emerge from the case study including the importance of dynamic capabilities, governance mechanisms, change management routines, organisational learning, performance measures and alignment with organisational strategy. Finally we discuss the implications of the BAIP model for researchers and practitioners, and conclude the paper with some suggestions for future work.
2 Background

BA systems enable managers and other decision-makers to interpret organisational data to improve decision-making and optimise business processes (Davenport and Harris, 2007). Several studies report benefits achieved with BA systems. These include marketing applications aimed at reducing customer attrition, increasing customer profitability and improving the response rates of marketing campaigns (Kohavi et al., 2002). Other areas where analytics has been used include manufacturing, production planning for order delivery (Ibid) and supply chain operations (Trkman et al., 2010). Davenport et al. (2010) highlight the importance of data, enterprise orientation, leadership, strategic targets and analysis to describe how benefits can be achieved with BA systems.

Three insights can be derived from the published case studies. First, the use of BA systems in business decision-making is dispersed throughout organisations involving multiple stakeholders from many functional areas. Second, benefits from BA systems are achieved by enabling organisational capabilities, so that data-driven insights are used in daily tasks and business processes. Third, new BA opportunities are periodically sensed and appropriate resources are allocated to renew organisational capabilities and increase business benefits.

Within an increasingly turbulent business environment and with rapidly changing technologies, organisations are using BA systems to facilitate innovation in business processes and decision-making (Davenport et al., 2010). The RBV and particularly dynamic capabilities theory provide a means of describing how these BA innovations are introduced to organisations.

2.1 The resource-based view and dynamic 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 processes and routines, people and their skills and knowledge, and technology including applications and data infrastructure. To be of strategic importance, resources must be valuable, rare, inimitable and non-substitutable (VRIN) (Barney, 1991). Within the RBV, organisational capabilities are a critical determinant of firm performance (Aral and Weill, 2007). However, this view has been criticised as being too static in turbulent environments and dynamic capabilities were proposed as a means of renewing and reconfiguring organisational resources to respond to rapidly changing environments (Teece et al., 1997), including rapid technology changes. Dynamic capabilities are “the capacity of an organisation to purposefully create, extend or modify its resource base” (Helfat et al., 2007, p. 4). Wheeler (2002) decomposes dynamic capabilities into four simpler capabilities: choosing new technologies; matching technologies with economic opportunities; executing business innovation for growth; and assessing customer value.

In this paper, we extend our previous work (Shanks and Bekmamedova, 2012) and include concepts from the NEBIC model (Wheeler, 2002) to develop a new process model that explains how business value and competitive advantage can be achieved with BA systems. We focus in particular on identifying and implementing new strategic opportunities using BA systems. Our research question is:

How do business analytics enabled innovations bring value to organisations?

3 The Business Analytics Innovation Process Model

The BAIP model describes how BA-enabled innovations are introduced into organisations through a series of innovation cycles. It is based on concepts from dynamic capabilities theory (Teece et al., 1997) and NEBIC (Wheeler, 2002). Dynamic capabilities are conceptualised as comprising several simpler capabilities: search for new opportunities, select opportunities with high potential value, and orchestrate assets to mobilise existing resources and reconfigure resource configurations (Baretto,
2011). Wheeler (2002) developed a similar conceptualisation of dynamic capabilities in his NEBIC process model that explains how organisations create business value through net-enabled innovations. Those capabilities include choosing enabling/emerging technologies, matching with economic opportunities, executing business innovation for growth and assessing customer value. We have adapted the four simpler capabilities from NEBIC, reconceptualised them as processes and applied them to BA-enabled innovations. The BAIP model comprises four processes for choosing, justifying, implementing and measuring BA innovations, including a final process with the BA innovation in production (Wheeler, 2002; Shanks and Bekmamedova, 2012).

![Business Analytics Innovation Process Model](image)

### 3.1 BAIP model component processes

#### 3.1.1 Choose BA Innovation Option

Choose BA Innovation Option involves the identification of opportunities for the innovative use of BA systems to generate insight that may be of value to the organisation. Various stakeholders including BA experts, data analysts, business users, and managers may suggest the new opportunities. Innovations may come from new developments in BA technology, vendor marketing, insights generated by BA experts analysing organizational data or business users (Wheeler, 2002; Shanks and Bekmamedova, 2012). BA innovation options need to be vetted for their potential value and risk to the organisation. Only options with high potential value are taken to the next stage in the BAIP process.

#### 3.1.2 Build BA Innovation Business Case

Build BA Innovation Business Case involves matching economic opportunities with the BA Innovation Option by developing a business case (Wheeler, 2002). This includes assessing each BA Innovation Option in terms of capital commitment required, shifting customer or business trends, risk assessment to the organisation, and allocation of resources including time, people and management attention (Ibid). Also, it includes alignment with objectives and business strategy (Davenport et al., 2010). After BA Innovations have been selected as viable and subjected to the rigorous development of a business case, some are selected for implementation.

#### 3.1.3 Implement BA Innovation Solution

Implement BA Innovation Solution includes the reconfiguration, integration, acquisition and divestment of resources to align with the new innovation (Wheeler, 2002). It requires organisational routines for project management, change management including user training, and a culture that embraces change (Ibid). Potential obstacles to implementation include political resistance within user groups and power-based issues between functional areas.
3.1.4 Define Measures for BA Innovation Value

Defining Measures for BA Innovation Value enables an organisation to assess the impact of the implemented BA Innovation solution. Typically the measures involve financial (e.g. revenue, costs), perceptual (e.g. customer satisfaction) and behavioural measures (e.g. rate of usage of BA insights). Each of these measures has a time lag from the initial implementation of the BA Innovation solution. Some financial indicators will not be apparent for some time, and some perceptual measures are forward looking indicators (Ibid).

3.1.5 BA Innovation in Production and Organisational Learning

After the four processes for choosing, justifying, implementing and measuring BA innovations have been completed, the BA Innovation is put into production, and used within the organisation. As the BA Innovation is used, its impact will be periodically measured. Each innovation is individually measured, and experiences gained can be used to guide the evolution of BA Innovation processes, and strengthen the underlying dynamic capabilities (Eisenhardt and Martin, 2000; Wheeler, 2002).

We define organisational learning as collective learning-based mechanisms that engage feedback to communicate insights and ideas for improved technology vetting and initiative planning (Ibid). These insights are based on experience and knowledge gained within the organisation from the success or failure of BA Innovations in use. They may be based on feedback from customers, experience within the organisation in using the BA Innovation and measures of impact of the BA Innovation over time. Organisational learning is essential to continuously improve the processes in the BA Innovation Cycle.

4 Research Method

We use a single case study research approach. Case studies are particularly useful for in-depth studies of contemporary phenomena within their organisational context (Yin, 2008). They provide a rich and detailed description of the phenomena and describe how and why outcomes occur. The unit of analysis was ‘the use of BA in the supply chain and device management areas’ within of a global wireless device distribution and supply chain service provider. Single case studies are appropriate when they are revelatory (Ibid). The case study reported in this paper is revelatory as the BA innovations implemented as part of the outsourcing agreement were novel and crucial to the success of that agreement and intended for subsequent use in other branches of the organisation globally. We were provided with access to the key stakeholders involved, including senior managers, BA managers and experts, project managers, and staff who interact with others within the organisation that use the BA systems. 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 thirteen interviews with key participants (see Table 1) over a period of three months in 2011, with each interview lasting about one hour. The interview protocol was based on concepts in our process model. All interviews were recorded and transcribed. We used thematic analysis to identify common patterns and themes emerging from the data (Boyatzis, 1998).

<table>
<thead>
<tr>
<th>Roles</th>
<th>Interviewees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Senior Managers</td>
<td>IT Regional Director (1), Device Management and Market Intelligence Director (2), Regional Director of 3PL Operations (1), Supply Chain Planning Director (1) and Channel Operations Director (1)</td>
</tr>
<tr>
<td>BA Managers and Experts</td>
<td>Head of BA in Device Management (2)</td>
</tr>
<tr>
<td>Project Managers</td>
<td>Performance Manager (2), Device Management Reporting Manager (1)</td>
</tr>
<tr>
<td>Interaction Staff</td>
<td>Business Services Director (2)</td>
</tr>
</tbody>
</table>

Table 1. Case study interviewees.
5 Case Study

The case study involves a global wireless device distribution and supply chain organisation (Deviceco), with over 3,500 employees. Deviceco provides a range of services in the wireless device value chain, including manufacturers, operators, retailers and enterprises. It customizes and ships wireless devices on behalf of over 60 manufacturer partners to more than 160,000 points of sale worldwide and manages more than 80 million wireless devices annually. Deviceco has a large portfolio of wireless devices, from traditional handsets, to niche and converged (specifically designed or customised) products. In 2011, Deviceco reported revenue of US $5.7 billion. Deviceco’s business success is in its dynamic and innovative culture.

Deviceco has developed comprehensive set of supply chain solutions for strategic sourcing and new product introduction, supply chain optimisation, device lifecycle management, channel operations and customer care. These were developed by Deviceco’s Asia-Pacific office for its outsourcing client, an Australia-based telecommunication company (Telco), and later replicated in New Zealand, Hong Kong, South Africa, Mexico and Thailand. Deviceco has evolved from a purely device distribution company to one that provides value-added services using BA (including data warehousing, performance reporting, data visualisation and data mining).

The case study focuses on three BA innovations within Deviceco: development of an operating model; supply chain optimisation; and device management analytics. Each of these innovations has realised significant benefits for Deviceco and its clients over several years. We now describe each of these innovations using the BAIP model.

5.1 Cycle 1: Development of the operating model (2005-2007)

Deviceco initiated the development of an ‘operating model’ in 2005, aiming to transition from a device distributor to a data-driven supply chain provider. The operating model comprised comprehensive governance with committee structures, roles and decision rights of key stakeholders. It also included improved processes for distribution and third party logistics, strategic sourcing and device lifecycle management, and reporting capabilities. The operating model was supported by the establishment of a data warehouse to provide comprehensive reporting on key performance indicators (KPIs).

Choose BA Innovation Option: Deviceco set up a distribution centre in Australia in 2004 and subsequently signed exclusive outsourcing agreements for third-party logistics in 2005, and for retail supply chain operations early in 2006, with Telco. The operating model aimed to support Telco’s competitive position in the market by improving their ability to ‘get the right product to the right place at the right price with the right customer experience’. Initially, Deviceco had a global pricing database for mobile devices and operated two separate warehouses in Sydney, one dedicated to Telco’s stock and the other for the stock of its other clients. It made extensive use of IT systems in delivering its services, including many local databases and regional ERP system that monitored device stock levels and flows. A team was formed comprising people from IT, supply chain operations, business development, and marketing and strategy, to analyse supply chain processes and the maturity of the IT infrastructure. The outcome was to define an operating model, provide an efficient and effective supply chain solution, enable timely reporting on the KPIs, and provide a forum to negotiate future innovations in the outsourcing arrangement.

The operating model included new supply chain processes, a data warehouse with reporting capabilities, and a revised governance structure to provide an integrated portfolio of supply chain services. The new initiative was assessed as being viable, particularly in terms of improving service delivery to Telco and the provision of BA infrastructure.
Build BA Innovation Business Case: A business case was prepared for the operating model innovation. Two main benefits from the use of BA systems within the operating model were highlighted. First, the data warehouse and reporting capabilities enabled Deviceco to optimise the supply chain and related processes in its outsourcing relationship with Telco. Second, the high quality data in the data warehouse enabled Deviceco to report on the KPIs to Telco and demonstrate cost savings and revenue creation. Subsequently, a decision was made to support the initiative and implement the operating model within the existing outsourcing agreement.

Implement BA Innovation Solution: New governance mechanisms were implemented by defining two new meeting cycles. A weekly meeting was scheduled for Deviceco managers to review progress on the provision of supply chain management services to Telco and to consider new innovations. A monthly cycle of meetings was scheduled for a combination of senior Deviceco and Telco managers to consider reports and to identify new sources for innovations. A data warehouse was developed with data sourced regularly from Telco’s operational systems. The data warehouse included data about devices, inventory levels across the supply chain, procurement, device usage, and revenue from devices. Related tools supported strategic sourcing (e.g. supplier collaboration portal), device lifecycle management (e.g. product lifecycle management reporting tool), supply chain tools (e.g. web-based product ordering portal) and channel management tools (e.g. web-based training portal).

“Functional aggregation is where we have our advantage...We add in the market analytics, the device management, and the channel operations.” (Business Services Director)

The combination of governance mechanisms, BA infrastructure and reporting tools provided a BA Innovation Solution to support the Deviceco-Telco outsourcing relationship. The meeting schedule within the operating model is known as the ‘operating rhythm’ and provides a pattern of regular meetings to better manage the outsourcing relationship and introduce cost saving initiatives.

Define Measures for BA Innovation Value: A large number of metrics was defined together with data to support them in the data warehouse. These included the KPIs outlined in the outsourcing service level agreement and other data used by Deviceco to optimise its services. A key metric was contribution margin, the marginal profit per unit sale. Deviceco can calculate the contribution margin for each device sold and then aggregate it in many ways (e.g. type of device) to support decisions.

“Data is one of our biggest differentiators against the competitors.” (Regional IT Director)

BA Innovation in Production: The operating model has been very successful in supporting the provision of high quality supply chain logistics services to Telco and leveraging BA to provide data-driven optimisation and accurate reporting on KPIs. This enabled Deviceco to clearly demonstrate the value for Telco in the outsourcing relationship. The governance mechanism and operating rhythm were very effective in maintaining a strong collaboration between Deviceco and Telco. During the first year of the partnership with Telco, Deviceco achieved AU$70 million in cost savings. As the relationship matured by early 2008, AU$246 million dollars in cost savings was achieved in procurement and supply chain activities (sourced from a public statement from Telco to its investors).

Organisational Learning: Successful use of the operating model and operating rhythm together with accurate reporting enabled the BA Innovation cycle processes to be enhanced. This organisational learning was informed by feedback from both Deviceco and Telco managers involved in the operating model and outsourcing relationship.

5.2 Cycle 2: Supply chain optimisation (2008-2009)

Deviceco initiated a supply chain optimisation program in 2008, designed to improve operational efficiency by the innovative use of BA to optimise supply chain activities and channel operations. This innovation worked within the operating model previously established.

Choose BA Innovation Option: Supply chain optimisation innovations included improved inventory forecasting, vendor performance management, supplier collaboration, stock forecasting, sales and
operations planning and reverse logistics (management of device returns). Advanced reporting, use of optimisation based on data, dashboard reports and data visualisation techniques were planned too support the innovation. The reports were largely driven by the service level agreement with Telco.

“We use business analytics in relation to physicals...trucks, warehouses, stock...lots of reports providing visibility of the availability and movement of stock.” (Business Services Director)

The innovation was assessed based on its fit with existing processes, technology maturity and viability. It was also vetted for its potential value and risk to the organisation.

**Build BA Innovation Business Case:** A business case was developed and included benefits such as cost savings and revenue increases in the areas of supply chain optimisation and reverse logistics, better decision-making using reports for key performance indicators, reduced stock on hand and improved forecasting of stock delivery. The business case was presented to Telco managers during the regular operating cycle of meetings and was supported for implementation as the part of the existing outsourcing agreement.

**Implement BA Innovation Solution:** The data warehouse was expanded to include detailed, accurate and standardised data from Telco operational systems, concerning supply chain operations, third party logistics services and device usage. Sophisticated reporting capabilities were developed including interactive reports with ‘push button’ selection of drop-down menus, and executive dashboards with data visualisation to improve decision-making. The reports focused on channel effectiveness, product usage and revenue at various levels of analysis. One new report that had significant impact was for reverse logistics. Detailed analysis of inventory and sales data and subsequent returns identified a significant number of ‘non-fault’ returns. These are mainly due to devices that were not set up properly when sold. Subsequently, Deviceco proposed a training program for Telco staff to ensure they had the required knowledge of devices and set up procedures. Subsequent data analysis showed a significant reduction in the number of device returns.

**Define Measures for BA Innovation Value:** New measures were defined for device usage, profitability, subsidy (the cost of providing a handset to a customer at reduced cost as part of a plan), channel effectiveness, contribution margin, cost per unit and customer satisfaction. These supported supply chain optimisation. Using the new measures, by 2009 Deviceco was able to demonstrate larger savings within Telco’s supply chain processes. Aggregated data provided a holistic and integrated view of the mobile device supply chain.

“Data supports our expertise...Deviceco is extremely good in product range and forecasting.”  
(Supply Chain Planning and Channel Operations Director)

**BA Innovation in Production:** Significant benefits were achieved in the areas of supply chain operations, device returns and channel operations. Within supply chain operations, demand-forecasting accuracy increased by more than 50%, operating costs reduced by 20% and average inventory levels (stock on hand) were reduced by 70%. Overall, the innovation decreased the costs of supply chain operations by approximately AU$100 million in 2009 (sourced from a public statement from Telco to its investors).

“The capability that we give to Telco in terms of ‘how’ and ’what if’ analysis cannot be found elsewhere.” (Performance Manager)

**Organisational Learning:** Successful implementation of the supply chain optimisation innovation increased confidence in the operating model and associated cycles of meetings, and enabled managers in both Deviceco and Telco to move from intuitive decision-making to evidence-based decision-making. Furthermore, as more advanced reports became available, a report consolidation initiative was established to reduce the number of reports overall and create a more standardised reporting structure, to improve the user interaction and understanding of report content across business units.
5.3 Cycle 3: Device management analytics (2009 onwards)

Deviceco initiated a device management analytics program in 2009, aiming to maximise profits by identifying which devices were in high demand and generate high average revenue per device (ARPD). This was intended to support decisions about device pricing, promotion and stock levels and for better planning of new product launches. This innovation worked within the operating model previously established.

**Choose BA Innovation Option:** Deviceco recognised an opportunity to leverage the rich data on device activation and usage in their data warehouse to provide a BA based service to reduce costs and increase revenues. The innovation supported device strategy and ranging (decisions about device portfolios), device lifecycle management, provision of contribution margin per device in real time, and new product introduction strategies. The innovation was assessed based on its fit with existing processes, data warehouse infrastructure, reporting and analytics capabilities and viability. It was also vetted for its potential value and business risk evaluation.

**Build BA Innovation Business Case:** A business case was developed highlighting potential benefits including improved stock levels of specific devices, better new product introduction strategies, and identifying and managing the retirement of unprofitable devices. There was substantial expertise within Deviceco about device management.

“We know our devices, we know how to buy and move handsets.” (Device Management and Market Intelligence Director)

The business case was presented to Telco managers during the regular operating cycle of meetings and was supported for implementation as the part of the existing outsourcing agreement.

**Implement BA Innovation Solution:** The data warehouse was enhanced to provide data to support device management analytics and several data analysis tools were acquired and developed internally including the RapidMiner data mining tool, BI Cognos, and executive dashboards. Additional expertise in BA was obtained by hiring a person with strong data and statistical analysis skills and knowledge to fill the Head of BA role, and drive the initiative. Use of the tools and capabilities enabled sophisticated analysis of device usage patterns and supported data-driven insights.

One important task of the Head of BA was to ensure that Telco managers made use of the new device management innovation, and were aware of its potential use.

“There is no shortage of reporting teams...There are literally dozens of internal reporting teams [at Telco]...it is important to have an executive sponsor to whom we target those recommendations. So they can act upon them.” (Head of BA)

**Define Measures for BA Innovation Value:** A number of device management measures were defined including average revenue per device (ARPD), usage per device and cost savings overall per device. Many measures that were used to determine past performance were now used strategically for stock forecasting, device range management, better promotion and marketing by device type, and for planning the introduction of new devices.

“Previously, our service was used to look at what went wrong...Now, they say ‘Give me a tool that will allow me to make the right decision about the life cycle of my products...” (Business Services Director)

**BA Innovation in Production:** A number of benefits were achieved including a much better understanding of which devices were used by which customer segments, and which devices returned the highest ARPD. This enabled improved marketing campaigns, improved promotion of devices in retail outlets and identification of devices ready for retirement. The introduction of new products was also informed by better information about devices.
Organisational Learning: Organisational learning occurred after the innovation was successfully used as Telco managers understood better that a focus on usage driven profits rather than connection driven profits was desirable. This was clearly demonstrated by the advanced BA reporting and data mining. The innovation also led to a strengthening of the evidence-based management culture within Telco.

6 Discussion

The BAIP model has provided a lens through which we have described three cycles of BA innovations. Dynamic capability theory underlies the BAIP model and is important in renewing organisational BA capabilities to maintain value creation and competitive advantage. A number of themes for BA innovation have emerged from the case study.

6.1 The Importance of Governance for BA Innovations

Governance concerns the assignment of decision rights and responsibilities, accountabilities and committee structures for innovations with BA (Weill and Ross, 2004). The operating model innovation strengthened the governance mechanisms within the Deviceco-Telco outsourcing relationship. They were crucial for both introducing new BA innovations and reviewing service level targets within the outsourcing agreement. Accurate and timely reporting of key performance indicators demonstrated significant improvements in efficiency and associated cost savings within the outsourcing agreement and led to increased trust in the relationship. A well-defined governance structure was important for the realisation of dynamic capabilities within Deviceco and provided the framework within which BA resources are renewed to support BA innovations and respond to changing market conditions (Eisenhardt and Martin, 2000).

6.2 Change Management to Embed BA within the Organisation

Effective change management was crucial to the success of the BA innovation cycle, and to ensure that BA innovations are embedded within the processes, routines, culture and IT infrastructure of organisations. Over time, BA permeated the ‘social fabric’ of the organisations (Davenport and Harris, 2007) including core values, the routine behaviour of individuals, processes and integration of BA driven insight into operational systems. Decision-making at both Deviceco and Telco evolved from ‘gut feel’ experienced based decision-making to evidence-based decision-making (Pfeffer and Sutton, 2006). BA became embedded within the ‘DNA’ of both organisations. High quality reporting led to evidence of success in the outsourcing relationship which moved from one based mainly of formal controls to increased cooperation and trust between the two parties (Poppo and Zenger, 2002).

6.3 Organisational Learning is Important for Successful BA Innovation

Organisational learning is represented as feedback loops within the BAIP model. In Cycle 1 of the case study, successful use of the operating model led to several refinement iterations, particularly for measures, and also for the operating rhythm. After the operating model matured through several iterations, it became sufficiently stable and mature to be used in other arrangements globally (e.g. New Zealand, Hong Kong). In Cycles 2 and 3 of the case study, measures were used to clearly demonstrate how optimisation of supply chain activities, channel operations and device management provided significant benefits to Telco in the outsourcing agreement. Experience with these initiatives led to increased confidence in BA-enabled innovations and associated measures, leading in turn to more innovative ideas. Organisational learning occurred through positive feedback within the BAIP innovation cycle. Organisational learning involved skill and knowledge building based on the repeated execution of the BA innovation cycle and is a major part of any effort to improve organisational performance and strengthen competitive advantage (Senge, 1993, Wheeler, 2002). Due to cumulative
learning over several innovation cycles, the BA innovations introduced (e.g. device management analytics) have subsequently become part of organisational routines around services for device management and supply chain logistics.

6.4 Alignment of BA-enabled Innovations and Business Strategy

The close alignment of BA innovations and business strategy is important to the strategic use of BA. BA-enabled services became an important means for Deviceco to provide value to its outsourcing partners and to compete with other global wireless device distribution and supply chain organisations in highly volatile and turbulent environments. The BA innovations implemented became an important component of Deviceco’s business strategy (Davenport and Harris, 2007). In particular, the development of device management analytics enabled Deviceco to compete on value added services in addition to supply chain optimisation.

6.5 Development and Renewal of BA Capabilities and Assets

The development of BA capabilities and assets including people, technology, data and resource renewal was important to the successful use of BA within Deviceco. People with ‘hybrid’ skills and knowledge in BA technology, business and communication are crucial. It is also important to have people with entrepreneurial capabilities who take ‘actions’ based on insight from BA systems that lead to benefits (Shanks and Bekmamedova, 2012). Mature and high quality BA technologies and data are important for success with BA. Data warehouse technology, high quality data, reporting and visualisation tools, statistical analysis tools for forecasting, segmentation and other forms of analysis and systems integration tools are necessary. Deviceco developed its BA technology assets significantly throughout the outsourcing agreement with Telco, enabling the provision of innovative BA services (Davenport and Harris, 2007). Deviceco used the operating model to continuously change and renew existing BA capabilities and implement new BA-enabled innovations (Teece et al., 1997). Dynamic capabilities are crucial in turbulent business environments to ensure that BA-enabled innovations provide value and maintain competitive advantage.

7 Conclusion

In this paper, we propose the BAIP model, which explains how BA-driven innovations are selected, justified, implemented and measured and used to renew the BA capabilities within organisations. The BAIP has been valuable for representing and understanding the process of BA-enabled innovations in a case study involving a global wireless device distribution and supply chain provider. The BAIP will help practitioners plan for the introduction of BA-enabled innovations. It will provide researchers with a process model for describing and understanding BA-innovations. The study is limited in that it is a single case study within one industry sector. Further empirical research is required to refine and enhance the model using longitudinal case study research in different industry sectors.

Overall, the value of the BAIP is in conceptualising dynamic capabilities as repeated cycles of innovations (Wheeler, 2002). It reflects best practices with well-established routines for justifying funding, developing appropriate processes and governance structures, and identifying clear roles, lines of reporting and decision-making authority.

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