Business Model Innovation in Complex Service Systems: Pioneering Approaches from the UK Defence Industry

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Abstract. Manufacturers and operators of complex service systems are increasingly focused on customer-centric strategies. Examples include solution-based contracts, which provide more holistic approaches closely linking design, manufacture, use and reuse functions within a firm, or across a network of firms and suppliers, to deliver tailored value. Solutions deliver broader benefits that exceed the rewards of traditional transactional service delivery. Trends from the defence industry illustrate how innovative business models are applied in complex service systems to adapt and apply the knowledge resident in the firm and external networks. This paper seeks to share insights into understanding collaborative service approaches as firms adapt to changing market forces by retooling their priorities, focusing their resources, and adopting strategies driving new business models.

Keywords: Defence, Business Model, Innovation, Services.

1 Introduction

This study presents empirical data from the UK Ministry of Defence (MoD) which illustrates how innovative business models are being applied to deliver new forms of value through collaboration amongst suppliers and customers.

In their examination of customer solutions providers, McKinsey consultants illustrate how shifting from a product/manufacturing focus to a customer focus typically requires larger scale commercial and technical integration, as well as higher customization to individual customer needs (Johansson, et al 2003). By focusing on the customer's value chain, suppliers identify where they can best contribute to the customer's business (Slywotzky & Morrison, 1998). To achieve this end, many suppliers of complex systems are adopting customer centric attributes, which include adopting a customer relationship management culture, gaining a deeper knowledge of the customer's business, and initiating engagement based on customer problems/opportunities (Galbraith, 2002).

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A 2008 IBM survey found that nearly all of the 1100 surveyed corporate CEOs reported the need to transform their 'business models', however few believed they had the knowledge required to do make changes (IBM, 2008). Whilst suppliers often adopt the rhetoric of being customer centric, it is argued that customer centric qualities are rarely achieved in practice (Galbraith, 2002; Shah, et al 2006). Despite recent efforts in the academic literature, there has been limited attention on how customer-centric business model innovation is taking place in industrial complex systems markets, prompting calls for further empirical research (Jacob & Ulaga, 2008; Kujala, et al 2010).

Section 2 of this paper examines the concept of business model innovation and how this applies in complex systems environments. Section 3 presents empirical data from the MoD which illustrates how innovative business models are being applied to deliver new forms of value for suppliers and customers of defence systems. Section 4 summarizes findings from two in depth case studies. Finally, Section 5 presents a discussion of findings and a conclusion.

2 Literature Review

2.1 Business Model Innovation

What is a business model and how does this theoretical concept translate into practice? While Amit & Zott (2001) declared that "a business model depicts the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities", Casadesus et al (2010) described a business model as "a reflection of the firm's realized strategy". Each of these views captures elements of the phenomena of business model innovation; however, Osterwalder & Pigneur (2011, p 15) provide the most useful definition for further analysis, "A business model describes the rationale of how an organisation creates, delivers, and captures value and serves as a blueprint for a strategy to be implemented through organizational structures, processes, and systems". This paper adopts Osterwalder's (2005) nine distinctive business model elements as a framework for analysis as shown in Figure 1.

David Teece argues that business models 'have considerable significance but are poorly understood – frequently mentioned but rarely analysed' (Teece, 2010, p172). Similarly, in business-to-government contexts, scholars and practitioners alike identify the pressing need for business model innovation study (Miles & Trott, 2011). Kaplan & Porter cite dysfunction in US health care and describe missed opportunities, underutilized resources, and misguided business models (Kaplan & Porter, 2011). Innovation through changing business models allows firms to develop a more completive view of their organization, customers, suppliers and the environment in which the firm operates.

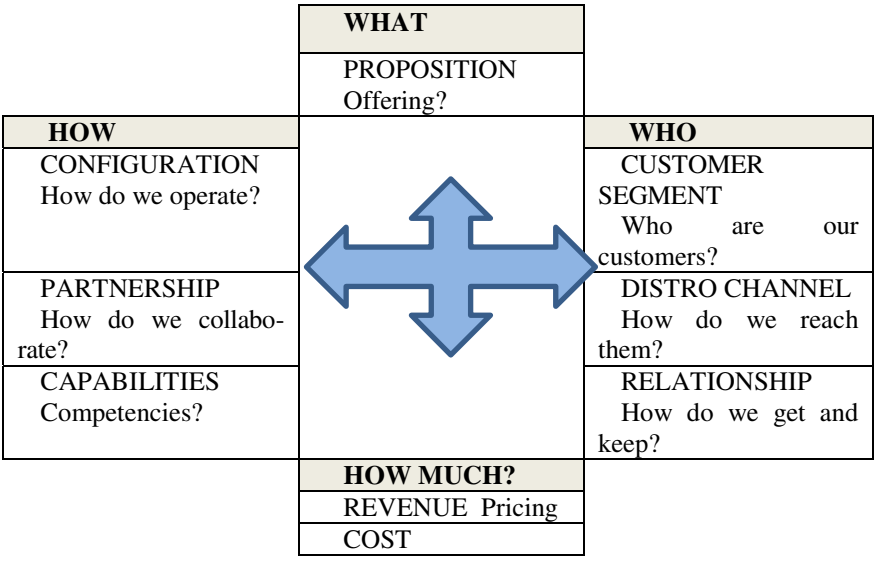

Fig. 1 Business Model Elements

Generically, this paper looks at firms engaged in the provision of complex service systems. Specifically, it examines service innovation in a defence industry context and draws on business model frameworks to capture insights.

2.2 Complex Engineering and Service Systems Industries

In complex systems industries, like the defence sector, the provision of customer solutions is an example of a fundamental departure from traditional supply and support business models (Galbraith, 2002; Davies, 2004; Kujala, et al 2010). Unlike selling a product, a customer solution is based on a value proposition, and is realised through fluid service agreements that are designed to improve the customer's operations. Customer solutions are often output or outcome based and difficult to imitate, thus providing a source of sustainable competitive advantage. Notable suppliers of customer solutions include General Electric, IBM, Rolls-Royce and Siemens (Slywotzky & Morrison, 1998; Cerasale & Stone, 2004; Wucherer, 2006).

Customers of complex systems are subject to increasing operational pressures such as the rising complexity of technology, unforeseen costs, obsolescence, poor governance decision-making and tighter budget constraints (HM Treasury, 2007). Many customers are reforming their complete system acquisition practices to address these issues (Robertson & Haynes, 2010). Unlike outsourcing, customers are now seeking to work more effectively alongside external partners/ suppliers to improve the organisation of their large scale industrial integration activities, as

well as the utility and performance of core services to end users (Pew & Mavor, 2007; Whitehead, 2009).

2.3 Research Gap

Although the extant literature has usefully highlighted the case for business model innovation, as well as differences in philosophy between traditional offerings and new collaborative business models, there remains much scope for exploring how innovation is taking place at the practical level. As argued by Baines, et al (2009, p 12) service design and management is a relatively new area of study, and "yet to be explored are the detailed practices and processes needed to deliver integrated products and services."

3 Study of the UK Defence Industry

Support efforts between industry and the UK Ministry of Defence (MOD) provide an ideal context to study the on-going transformation from a manufacturing to a service based enterprise and more specifically the adoption of a customer focused business models. The UK has the fourth largest defence budget in the world of which an estimated £18 billion is spent on defence in manufacturing and service (Secretary of State for Defence, 2012, p 7).

The United Kingdom's Defence Industrial Strategy (DIS) authored in 2005 was a critical catalyst in shaping a new paradigm for UK defence acquisition. Three objectives from the UK Industrial Strategy have implications for this paper: (1) a shift in defence acquisition, away from design and manufacture of leaps in capability and upgradable platforms, toward a new paradigm focused on in-the-field operational performance, (2) an emphasis on through life capability management, characterized by modularity and sustainability thinking, and (3) longer more assured revenue/expense streams based on long term support and development (Secretary of State for Defence, 2005).

In early 2012, the UK Ministry of Defence published its latest policy paper on defence acquisition - 'National Security Through Technology', which supplements the Defence Industrial Strategy 2005 and the Defence Technology Strategy 2006 (Secretary of State for Defence, 2012). The report concedes that that neither SMEs or MoD are qualified to manage complex system solutions as SMEs "lack the capability or capacity to deliver a complete platform or weapon system, particularly where this demands complex integration, high-volume or capital-intense manufacturing" and MoD "lacks the resources and skills needed to manage the task and the associated risks, which can be considerable" (Secretary of State for Defence, 2012, p. 60). Consequently defence industry firms play the crucial role of prime contractors to deliver and support weapons or systems and manage the associated multi-organizational networks required to deliver solutions.

In response to these policy shifts and the changing economics of manufacturing as firms increasingly transition to service provision, defence firms have engaged in several innovative partnerships in support of UK military forces. These ventures

are not routine collaborations; they are complete organizational transformations where structures, operating procedures, workforces, and service delivery systems are redesigned to implement a customer centric business approach.

3.1 Methodology

Empirical insights provided by company literature, reports, and industry analysis provided a means to frame the issues and opportunities associated with service business model innovation in defence. Defence firm perspectives were captured at the enterprise, operating business, and functional level. Once illustrative projects were identified that best captured innovations in contracting collaboration within the focal firm (BAE Systems), the authors engaged with key project programme managers, designers, engineers, production leaders, and customer service representatives. Semi structured interviews with key leaders involved in the design, delivery, and management of service varied in length from 30 minutes to over two hours. Twelve in-depth interviews were held with industry supplier and government (uniformed and civil MOD) staff, working on two major MOD complex service projects.

The first project focused on 'availability contracting' of Royal Air Force (RAF) Tornado aircraft, which is a mature programme established nearly 10 years ago. BAE Air Solutions is the lead in the Availability Transformation Tornado Aircraft Contract (ATTAC), a Tornado fighter jet support programme that provides a context to retrospectively examine the role of business model changes on a successful transition to availability contracting. The theory behind this approach yields stable service provision and predictable cost for MOD and revenue for industry.

In contrast to the RAF case, the second Royal Navy (RN) example is a more recent endeavour (2007) which examines support across a series of platforms both on ships, submarines and on the waterfront as part of the Warship Support Modernisation Initiative (WSMI). Like the RAF, the Navy's intent is to maximize platform availability while minimizing through life support costs. Both cases are summarized in Table 1.

Table 1 UK MoD projects examined in this study

Defence Project	End User Customer	Prime Supplier(s)	Contract features
ATTAC	Air Force (RAF)	BAE	Aircraft availability support
		Rolls Royce	Depot-level support and maint.
			Monitor system health, costs
WSMI	Navy	BAE,	Ship availability and capability
	(RN)	Thales,	Managing ship engineering
		Babcock	Monitor system health, costs
			Synch design, production, support

4 Findings

4.1 Value Proposition

In their examination of strategy in the firm, Kaplan and Norton suggest that satisfying customers is the source of sustainable value creation (Kaplan, 2004). Satisfaction in service business models is anchored in identifying a value proposition by considering benefit to customers, service differentiation, and a strong insight into customer needs and requirements. This customer centric view of a value proposition, as described by Anderson (2006), requires in-depth knowledge of the market and future trends, an understanding of the firm's capability to deliver compared to alternative solutions, and strong customer relationships.

4.1.1 Service Provision to the UK Royal Air Force

ATTAC was established as a long term availability contract which transitioned responsibility for service and support from the Royal Air Force to BAE Systems. The military pays for a specified level of aircraft availability. The level of support is extensive and includes routine and scheduled maintenance, management of spare parts, and detailed collection and sharing of crucial flight and mechanical information for the Royal Air Force. These services are provided at a fixed negotiated cost where BAE has strong financial incentives to meet or exceed availability goals. A fundamental mind-set change from the traditional sale of spares and payment for maintenance following the sale of an asset, this new model was best summarized by a service managers as being, "A reasonable profit many times, not a big fast buck once".

4.1.2 Service Provision to the UK Royal Navy

The Royal Navy in Portsmouth has relinquished ownership of various functions in the logistics arena including warehouses and related inventory and management, facilities upkeep, catering, and dockside operations. Waterfront operations, led by BAE Systems, have moved away from government provided services to contractors who serve as systems integrators across a constellation of sub-contractors in-tent on improving efficiency, applying commercial expertise, maximizing commercial technology, and lowering costs for the customer.

The value proposition in the maritime case is similar to that of the air domain as industry seeks to assume responsibility for military maintenance and support; however, the Warship Modernisation Initiative goes further than delivering availability contracts for ships and includes elements of capability contracting. The Ministry of Defence Acquisition Operating Framework describes capability as the enduring ability to generate a prescribed outcome of effect (MOD, 2009). Applied to industry, this definition translates into the ability for a platform or system to deliver a specific requirement.

What is unique about this approach is that ownership of the asset no longer rests with the customer as their interests are met not by a product or platform, but an outcome. The Royal Navy in Portsmouth has relinquished ownership of various functions in the logistics arena including warehouses and related inventory and management, facilities upkeep, catering, and dockside operations. Expanding the value proposition for the customer through a mix of capability and availability contracting model is an innovative move forward that presents the opportunity to learn from both its early successes and future challenges.

4.2 Value Configuration through Partnerships

Both cases examined demonstrate specific ways in which firm's chose to configure to deliver value. In each case the firm organized people and processes differ-ently, yet delivered successful service.

4.2.1 Integrated Teams at BAE Air Solutions

Various initiatives that increase integration across boundaries were taking place across the air domain. First, five hundred uniformed RAF work at RAF Marham as part of ATTAC. Many airmen work for civilians; conversely, civilians work for MOD. The organizational structure is very unique and not common in the UK military. Second, the use of customer-supplier 'Integrated Logistics Operation Cen-tres' (ILOCs) to collocate procurement staff, has improved overall contract responsiveness. In many instances, the extent to which service performance addressed customer needs was tied to collaborative individual interpersonal relationships and a joint-service ownership mindset. What appears to have been one of the most important factors, according to the programme manager, was the project team's ability to "coordinate, collaborate, and communicate".

When reflecting on the programme, an industry leader commented that "ATTAC is not a partnership with the RAF, it's a marriage". To underscore this point, the word trust was frequently used to describe the partnership between BAE and the RAF. Nearly everyone who participated in interviews, telephone follow ups, or presented briefings mentioned the importance of mutual trust. The Programme Manager empathized that any success they enjoyed was because of the partner-ship, "It's all about the relationships".

The senior Warrant Officer at BAE Air in Marham was particularly candid in sharing his views on the role of service and industry culture in building partnerships. He shared that the friction continues, but it is largely managed by strong leadership on both sides. Most of the friction is cultural. He said, one partner works for profit, the other to serve the country. While they are one team, their objectives are different. The RAF still doesn't quite understand BAE, BAE still doesn't quite understand the RAF, even after five years. "Organizations are different. Different is good".

4.2.2 Broad Partnerships at Portsmouth Naval Base

Unlike the organisational structure at RAF Marham, the Royal Navy's integration into BAE was not extensive (a few seconded Naval Officers being the exception). Nonetheless, the Royal Navy and BAE did uniquely configure to support service delivery. Instead of fully integrating, the approach adopted was a partnership that included customers, suppliers, stakeholders, and placed BAE Systems in the role of the primary integrator.

A visible signal that the partners involved in the maritime undertaking was the name adopted by consortium of client, firm, and suppliers – Team Portsmouth. Interviews revealed a sense of shared responsibility for both success and failure that did not serve to isolate either Prime or Customer and thus created a healthy ethos focused on problem solving versus blame.

This diverse coalition of partners provided the organization more flexibility to grow and adapt to future requirements more easily by adding more partners or refocusing and thus avoided retooling any single organization. Second, a collaborative partnership allowed competitors to participate as contributors to specific aspects of the overall naval base initiative and still keep portions of their business separate from their competitors. Finally, standing partnerships increased the speed at which decisions were made and decreased time spent in negotiations.

Importantly, partners agreed to provide stability at the top management and senior decision making levels to mitigate the knowledge drain associated with frequent personnel moves. Personnel turbulence at MOD and BAE resulted in lengthy periods of rebuilding organizational understanding and delays establishing bonds of trust. A senior manager at Portsmouth commented, "You have a customer for two or three years, then we get a different person, with a whole set of different ideas. This is not the way to run a business".

Finally, like the RAF ATTAC project, WSMI is part of a broader effort by BAE Systems at Portsmouth to support various ships that are also under separate availability contracts with BAE. Therefore, decisions that could negatively impact one element of the contract could well benefit the firm in other ways if support was improved by to that ship by reallocating resources to meet a timely or urgent need. Networked complex systems often require a different management mind-set capable of seeing a bigger picture beyond the boundaries of their business unit.

4.3 Value Delivery by Focusing the Firm's Capabilities

A firm's capabilities represent its core competency and thus provide a source of competitive advantage. As detailed earlier in this paper defence firms are increasingly redefining their value as solutions providers, moving away from traditional production models. In both cases, our observations led us to recognize the difficulty inherent in aligning corporate, business and organizational objectives and cultures, and thus delivering value. A summary the factors influencing the delivery of service is summarized in Table 2.

Table 2 Factors Influencing Service Design and Delivery

Business	Customer	User
BAE & Partners	MOD	Front Line
Profit	Cost/Value	Cost Insensitive
Reputation,	Political Trade-offs,	Effectiveness,
Business Development	Balance Forces	Force Structures
Business Culture	Political Culture	Military Culture

Given these often divergent interests, the capability of a firm to design and manage a service delivery system to address these tensions is a prime source of competitive advantage as it works to deliver a solution that all stakeholders support.

4.3.1 Managing Contract Support to the Royal Air Force and Royal Navy

Challenges to service improvement through collaboration in the RN mirror those experienced nearly a decade earlier in the RAF. Three obstacles stand out as recurring themes in interviews with key leaders: MOD personnel turbulence, changing requirements driven by either combat missions or political and policy shifts, and skill set imbalance in a workforce accustomed to a manufacturing and now adjusting to a service and support focus.

Industry has responded to mitigate these obstacles and build more positive outcomes. BAE Military Air Solutions contracts are deliberately vague to provide flexibility to jointly prioritize effort. These cooperative themes were echoed on the maritime sector in the establishment and management of Key Performance Indicators (KPIs) developed to sustain and improve service I both cases. KPIs were broadly defined and in practice reflected achievement in all areas measured. KPIs were not frequently changed or "tightened" as was the case in more competitive contractual arrangements seen elsewhere in the firm. This arrangement was beneficial as it allowed the team to see when something was off course, yet gave them the flexibility to problem solve and avoid conflicts over variances in performance parameters. While it could be argued that this soft KPI arrangement is precisely one of the hazards of overly close collaboration, both firm leaders and customers pointed out that the programme leadership frequently challenge the status quo to deliver more "output for less money while fostering a culture of dialogue and knowledge transfer, not by using KPIs to create counterproductive competitiveness amongst the team".

Both the ATTAC and WSMI projects kept information flowing with the customer. At Portsmouth "Intelligent Customer Meetings" held three times per week encouraged frank discussions amongst stakeholders iron out both short run and longer term issues. For instance, a senior leader on the team described the type of scenario ordinarily discussed and solved at these meetings as follows:

"If someone in fleet engineering phones up and books a crane, it's covered by the plant budget. So the cost is not actually against that specific project. The commander says, 'I don't care how much the crane is costing, I want the carne

there' despite its only carrying out one lift a day. Consequently that underutilized crane costs £3,000 a day to do one lift. This is a problem." Culturally, a military commander gets what he or she needs to accomplish the mission. Partnerships require more flexibility than declaring that the 'customer is always right'. They aren't. Consequently, having a uniformed officer seconded to industry, or an industry leader imbedded in a military organization, helps both sides understand the complexities of certain issues.

Air and maritime domain cases revalidated the importance of leadership, trust, and proper organizational alignment.

5 Conclusions

In the last decade, service innovation has not only taken root at firms like BAE Systems and other large scale manufacturing multinational firms, it has altered how these firms do business. This paper has identified innovative areas of collaboration based on the notion of value co-creation for the mutual benefit of members of a broader complex service network.

One area for future research is generalizability of specific elements of a customer solution based business model across a firm, industry, or a completely different context. In the defence, what may have worked for BAE and MOD in the maritime domain, may not work in the ground arena.

Four recurring themes stand out in interviews: Personnel turbulence, changing requirements driven by either combat missions or policy shifts, the importance of trust in collaborative networks, and a workforce skill set imbalance in an industry accustomed to a manufacturing and now adjusting to a service and support focus.

Successful collaborative teams were characterized by frequent interaction, dependence on one another, and delivering results and sharing credit (or sharing blame and the responsibility to fix). The means by which trust and intense knowledge of the customer's problems and the firm's capabilities are translated into value is through building robust partnerships that share information, measure system performance, and are well managed and led.

These cases illustrate that service programmes are difficult to manage and require new approaches to service design and leadership. Expanding the value proposition for the customer through a mix of capability and availability contracting model is an innovative move forward.

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