Value and Servitization: Creating Complex Deployed Responsive Services

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A value framework can be used to describe the servitization transformation from traditional manufacturing business model to the current endpoint of a complex deployed responsive service delivered within the customer’s dynamic environment, where the ability to capture worth is determined by the success of the customer.

Servitization highlights the trend in which firms seek to gain revenue by offering fuller market packages or bundles of customer-focused combinations of products and services. Many product offers have become commoditized in the eyes of the end user, which has led traditional manufacturing firms in particular to pursue extra revenue downstream through services. For many manufacturers the provision of services, previously seen as an additional activity (Ren, 2009), would now appear to be a necessity to maintain financial viability (Neely, 2008). This change in business focus and strategy brings about new challenges and opportunities.

As manufacturers are ‘adding service,’ there is a tendency in both literature and practice to treat service as an extension of the manufacturing and engineering knowledge base (Ng et al., 2012). However, service and service provision is a very different form of business from manufacture. Manufacturing firms produce a unit and the transformation of materials and equipment undertaken in the production process is normally considered as the value-creating activity and the unit of analysis (Slack et al., 2013). The focus of value realization is at the point of exchange where the unit is sold and worth is captured for the manufacturing firm, usually as money. The customer’s use or consumption activity is frequently seen as separate from the manufacturer’s value-creation activity. A focus on exchange as the point of value realization is reflected in theory as a goods-dominant logic (Vargo and Lusch, 2004, 2008).

Service has proven difficult to define but has been characterized as different from product manufacture (Zeithaml et al., 1985), and the realization of service

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value is often presented as simultaneous with its production. A service provider can only create a proposition for a customer which has potential value, as value is only realized when the service is enacted. As service production is simultaneous with its consumption by the customer, customer and supplier firms are proactively involved in the realization of value, a construct described as being ‘co-opted’ into the design and delivery of services (Prahalad and Ramaswamy, 2000, 2003). The competence to create value from service comes from skilful coordination of complex resource combinations of products, providers, suppliers, and often the customer (Vargo and Lusch, 2008; Angelis and Edson, 2011; Daliwal et al., 2011). Worth may be captured through a fee, but payment may be contingent upon the customer realizing value from the offer. Therefore the notions of value proposition, realization, and worth capture are different from those of traditional manufacture. These are the elements of the business model (Baden-Fuller and Morgan, 2010), and past work has suggested that servitization requires a paradigm shift in both the perspective taken by managers and the business model they employ (Barnett et al., 2013).

This paper takes a business model perspective and examines the new business models employed by manufacturers following servitization. Through case study analysis this paper identifies and describes three manufacturer engineering business-to-business services using a framework of value proposition, realization, and worth capture. The three examples are for business-to-business services providing engine support services for civil and military aerospace and military ships. They are provided at the global scale and require multiple organizational resources for the service to operate. They illustrate a particular business model as an outcome of servitization as firms transform from sale of an asset to an offer of a use service based on the assured availability of assets.

The paper will proceed as follows. First, theory to support the case analysis includes the nature of servitization, the issues of unit of analysis, service complexity, and a model for value creation. A brief methodology is followed by the three case studies. Discussion of the case studies in light of theory then leads to the conclusion and future work.

Servitization

The unit of analysis

The transition from product manufacture to a focus upon service activity has been named ‘servitization’ (Mattyssens and Vandembempt, 1998; Vandermerwe and Rada, 1988; Anderson and Narus, 1995). There is an issue with regard to the unit of analysis when servitization is discussed, as although there is a long-standing agreement over the definition of products/goods, their characteristics and their production through manufacture, the definition of services has never reached consensus (Parry et al., 2011a). Whilst ‘manufacturer’ frequently forms the starting point for a firm’s servitization journey, the end point is varied.

The extent of servitization may be conceptualized as reflecting the spectrum of potential service offerings, beginning with a base service offering products and ongoing supply of spare parts; intermediate services offering scheduled maintenance and in-field service; and advanced complex services such as customer support or rental-type agreements (Baines et al., 2009, 2011a). Neely (2008) identifies five categories of product and service offerings which may result from servitization: product-oriented product–service systems (PSS), where ownership of the product is transferred to the customer and product-related services are provided; use-oriented service systems, where ownership of the product is retrained by the provider and the customer purchases use, as in lease arrangements; results-oriented PSS, where the product may disappear entirely and the customer pays for the result, such as voice messaging; integration-oriented PSS, where firms seek to add services by going downstream and integrating vertically, such as when an oil company also sells fuel to customers by operating petrol stations; and service-
oriented PSS, which occur when firms build services into their products, such as intelligent health-monitoring systems and their associated services. The ‘direction’ of servitization has further been conceptualized as forward integration, where the focal firm takes over the operations of a customer and backward integration, where they take over the operations of a supplier (Baines et al., 2011b). Neely (2008) notes that these services are conceptualized in the language of goods-dominant logic (Vargo and Lusch, 2004), where the focus of value is on the exchange relationship as opposed to a broader understanding of value co-created with, and for, the parties engaging in the activity (Vargo and Lusch, 2008).

**Complex deployed responsive services**

As firms have specialized and focused on development of their own core competences, to create and deliver services they must collaborate with partner firms (Mills et al., 2013). This adds to the complexity of multi-organizational service and raises a particular challenge for managers attempting to coordinate the resources employed to deliver the outcome of a service, as they must take a holistic approach, seeing beyond the individual business units and company structures and managing the whole system. The lead provider organization must impose a holistic management perspective on a complex system of interconnected and interdependent activities undertaken by a diverse network of stakeholders (Purchase et al., 2011a). It is this enterprise that in the end delivers the service experience.

Complex deployed responsive services (CDRS) are a particular form of engineering service where the service is based primarily not at the provider firm, but out in the customer’s operating environment (Parry et al., 2011b). CDRS have been characterized by recognition of three core interrelated business challenges: geographic coverage, customer demand, and meeting demand. These three characteristics were identified during analysis of business-to-consumer services and a single, relatively simple, global aviation field repair service.

The first challenge relates to the provision of geographic coverage such that the service is able to be in the correct location when required. Depending upon the service offered this may be local, national, regional, or global. Organizations typically divide their geographic area into zones depending upon the scale of the second challenge, customer demand (Parry et al., 2011b). Customer demand is challenging for firms new to this service provision, as to predict likely demand requires knowledge of the variables which drive demand. The third challenge, meeting demand, requires processes of communication such that the specific service requirement of the customer can be forecast and captured efficiently. Having captured the requirement the most appropriate resources must be deployed to address that specific demand. Managing customer demand becomes easier with time as a record of likely demand linked to environmental factors becomes established. For example, in the UK, the Royal Automobile Club (RAC) provides a national breakdown recovery service for cars. Through analysis of data they recognize that factors such as sporting events, national holidays, time of day, and particularly weather are key drivers of demand. Establishing variables for analysis allows prediction of likely demand that enables better demand planning. Further, common failure modes may be captured along with the likely way customers experience and communicate that failure. This knowledge allows for appropriate resources to meet demand being deployed. Over time, if complex services can be learning organizations, they are able to exploit their knowledge to become efficient and increasingly cost effective and competitive.

**Challenges of complexity**

One of the key challenges identified involves understanding and managing the complexity experienced in multi-organizational service enterprises (Purchase et al., 2011b). The term ‘complexity’ is frequently used but is resistant to clear definition and measurement (Foley, 1996; Pighin, 1998; Kim and Wilemon, 2003; Schlick et al., 2007) and there is resistance to clarification of the term if it involves
simplification of the concept (Elliot and Kiel, 1997; Cilliers, 1998). Complex systems are nonlinear; they do not necessarily act in a mechanical way and give outcomes that are sensitive to the initial conditions (Kao, 1997). Typically there is a disconnect between the behavior observed locally and the whole system-level behavior that can lead to system-level outcomes which can be counter-intuitive, named ‘emergence’ (Barabási and Bonabeau, 2003).

Complex services are challenging for managers as they may make local changes in good faith, expecting coherent system-level changes to occur and yet experiencing the opposite effect. Management of complex services requires organizational structures which are able to provide rigor to operational processes in order to maintain control, yet also remain flexible enough to enable managers to respond to and address unexpected issues (Schuh et al., 2008). Managers must understand the system when it is under control (Taylor and Tofts, 2009) and develop the ability to respond to emergence, coping with environmental, task, and customer requirement changes.

Value and business models
The focus of study for this paper is that of manufacturers moving to offer service to support an asset and deliver a desired outcome. The contracts put in place are generally either for an assured level of asset availability in service, or are designed to deliver an outcome for the customer. It is proposed that the creation of value through service is different from that of manufacture, due to the level of ‘co-opted’ resource across the extended enterprise, and so a different business model is required.

Business models narrate the business operation and describe the structure and strategy employed by a firm to differentiate themselves and compete (Magretta, 2002). Many authors make the link between business models and value creation. Zott et al. (2011) propose that business models are the descriptors of value creation. Business models are described by Baden-Fuller and Morgan (2010) as the process of customer engagement with a product or service, specifically focusing on how value is created and how worth value is captured sufficiently that the firm can achieve greater returns. Business model innovation is considered as the reconfiguring of the firm’s capabilities to increase value capture (Sabatier et al., 2010).

Baden-Fuller and Morgan (2010) state that over 66% of firms have not given thought to their business model and cannot articulate it. In addition, if the focus is incorrect or changes, then further problems arise (Edelman and Yli-Renko, 2010). In the extant literature, the emergent deviations from a proposed business model are largely ignored as the business moves from formulation to implementation (Demil and Lecocq, 2010). It is proposed that the business model is the sum of three interacting elements: value proposition, value realization, and worth capture.

Value has been ascribed many meanings and this work will follow Bowman and Ambrosini (2000), who provide a definition which spans many interpretations and propose that value is the perception of how ‘good’ something is within a situated context. Value is not a naturally occurring property, but is determined by how it is perceived (Ng et al., 2010). The process of value creation operates across and among the individual, organization, and society (Lepak et al., 2007). It is proposed that there are three parts to the value creation process: creating a value proposition, value realization, and worth capture (Osterwalder and Pigneur, 2010; O’Cass and Ngo, 2011). The authors have arranged the value elements into a framework (Figure 1), which presents the three facets of the business model interacting to form the value creation process.

The value Proposition is the system of valued resource necessary to deliver the purpose of the enterprise and includes materials and equipment, people, information and knowledge (Ireland et al., 2003; Ng et al., 2011). From a resource-based perspective, the firm creates its value offering based upon the resources which it is able to coordinate. A portfolio of potentially valuable resources does not mean that a firm can create value (Barney and Arikan, 2001; Priem and Butler, 2001). The resources
under a firm’s control are defined as the resource portfolio, and the maximum value-creating potential of the firm is defined by its portfolio. The value proposition cannot be offered and delivered in all potential contexts. The firm is limited in the number of resources which it may employ, and so it is limited as to the value it may offer. Vargo and Lusch (2004, 2008) propose that all propositions (or offerings) are service offerings, where the word ‘service’ reflects the process of using resources for the benefit of another entity.

The value Realization occurs when the proposition is enacted for the benefit of a customer. The proposition may be a product or service, but the proposition does not create value until the customer uses it, integrating the proposition into their enterprise to realize value. Value is determined by the cost and timing of the deployment of resources and is realized through the outcomes achieved by the process of application of the resource base for a stated benefit (Zott, 2003). Value realization occurs in the specific context of resource use by and for the benefit of the customer firm.

Worth Capture is the ability of both providers and customers to capture worth following the realization of the value of a proposition. Worth is usually the monetary exchange; the focus of goods-dominant logic (Vargo and Lusch, 2004). Sustaining value creation depends on the producer capturing value sufficiently to exceed costs, and the amount is determined by the user as a function of their perception of increased benefit compared with alternatives (Lepak et al., 2007). Without these antecedents, the user will not engage in future value realization and exchanges, making the business unsustainable. Lepak et al. (2007) use the term ‘value slippage’ to describe the situation where the value creator is unable to capture worth. Those who create value may find that other individuals, organizations, or society benefit more from their efforts than they do. Slippage acts to disincentivize long-term value creation.

Methodology
The research uses case studies to capture the business models from three complex deployed services offered by engineering firms. Two of the cases pertain to the military domain (aero engines and surface ships) and the third to civilian commercial aero engines. The cases were produced by senior managers from the firms involved in providing the services through a method of cooperative enquiry (Heron, 1996). A workshop was held where the theory of the business model and the value framework were explained and materials giving details of the theories from the literature provided. Guided by the theory, the managers then created case materials providing background on the context of the service and detailed operational information on the three service value elements: production, realization, and worth capture. The reports all contained key performance indicators (KPIs) and an enterprise image (Mills et al., 2013), a method for creating a visual depiction of a service enterprise. This image helped to show the organizational resources and business units employed in creating the service, and acknowledged both client and service provider roles in enabling behaviors that promote value co-creation (Vargo and Lusch, 2008). Owing to commercial sensitivity, it is not possible to show the images in this paper. Once complete, the cases were presented back to the group and scrutinized in a
workshop. The authors then codified the case studies and documented them here.

**Complex deployed responsive service case studies**

The traditional view of the business model for all the engineering firms was one of manufacture of a unit, undertaken within the firm’s facility with contribution from suppliers. With regard to power units, once the unit was complete the equipment was transferred to the business contracted to manufacture the platform and installed. Ownership was transferred to the customer and value for the unit realized at the point of exchange. Financial reward was given upon delivery and installation of the power unit. Following a process of servitization, the case study firms now offer a number of different services in support of their assets. Three of these complex services are now described.

**Civil aero engine health monitoring (EHM) service**

The firm is a provider of civil aviation engines to the airline industry. They have a traditional business model of asset sales and aftermarket support services with spares sales, but have been one of the first major engineering firms to engage in servitization. The EHM service is offered as part of a service package to large civil airlines to enable them to gain most benefit from the assets under control.

The value proposition in EHM is achieved by turning aircraft data into information and then communicating that information to the correct person in the customer organization in a timely manner. The EHM service exploits data and seeks to offer value through analysis and monitoring of the resource in operation, effectively allowing the airline access to the knowledge base of the engine original equipment manufacturer (OEM). The service is complex, as data from assets is complicated and requires processing, the assets are globally dispersed, and responses to the data in terms of advice must be provided quickly to the person capable of acting and with limited false alerts and no missed events. The service value proposition is both proactive and reactive.

The reactive service provides a non-intrusive direct warning of impending problems to the operator, allowing time for them to react before an event which may cause disruption to the service they offer. When a data trend emerges from the data that is deemed ‘of interest,’ an expert makes a recommendation to the airline to investigate. The action may require the airline, service provider, and/or a third party to provide services such as support, logistics, spares, etc.

The proactive service provides suitable information for the operator to understand the operation of their fleet and the general health of the assets under control. This includes provision of data and the analytics of their operation, such as any mechanical issues, speed, and temperature usage of the asset.

Close interaction with the customer base ensures that the analysis provided is fit for purpose. Owing to the interdependence of the business process, success of the service operation requires a strong customer relationship and close relationships with supply-side partners. The enterprise necessarily draws upon business units in both provider and customer organizations, as well as third parties for spares, maintenance provision, and logistics. Owing to the inherent complexity of the value proposition to facilitate management, a single service model is offered to the market with minimal bespoke elements. These limits make it difficult to offer the value proposition to all operators in all markets and to maximize worth capture for specific service applications.

Value is realized through both proactive and reactive offers. The reactive service facilitates the management of any operational issues ‘in-service’ and in a controlled manner, preventing any unplanned maintenance events. This represents co-created value as the proactive service helps the airline to run their operation more efficiently and hence improve margin. The OEM is able to understand the ‘normal’ operation of the resources at the fleet level, operator level, and individual asset level. This is not
without its challenges, not least that not all events evolve through a ‘standard pattern.’ However, over time accumulated knowledge accelerates the identification of issues, which is mutually beneficial. Under the terms of the service contract it is in the operator’s interest to keep the assets flying and earning revenue for the airline. Operators do not react in a consistent manner to the information presented, potentially resulting in unplanned disruption. Education is required to ensure appropriate response is made to all levels of information provided.

Worth is captured at multiple levels. Primarily, financial worth is captured through payment for the service. The service has mutual dependency and both parties benefit from more efficient operations. Disruption costs money to both operator and provider. Engine failures cost the operator financially in terms of aircraft on the ground and the provider in terms of repair costs. Failures also have a potential reputational cost to both companies. The data collected as part of EHM services allows the OEM to build on its knowledge base, increasing operational awareness and helping to enhance their service offering in the future, potentially capturing worth from additional customers.

Military engine service
The firm’s value proposition is a service contract guaranteeing engine availability to air force operators. The operation of the service requires cooperative working in the front-office space and also draws upon numerous resources and business units in both provider and customer organizations’ back offices in addition to third-party suppliers. There is a service delivery center manned by both provider and customer personnel, supported by the provider operations center and their engine overhaul facility. On-site technical support includes trouble shooting, EHM, and technical policy experts. The contracted goal is to keep engines on the aircraft as long as possible. On-site operations are supported off-site by the firm’s operations center at their manufacturing and service facilities. The offer proposes more predictable operations, shorter turnaround time, and greater asset availability for the customer.

Value is realized through the use of serviceable engines. The service is delivered through the service delivery center situated at the assets operational base. Decisions are able to be made rapidly and action may be taken on-site upon receipt of technical support from either on-site or back-office experts.

Worth is captured directly from the money paid to the firm for providing the service. The longitudinal nature of support contracts guarantees long-term revenue streams to the provider. However, the contract incentivizes the provider to keep the engine on the aircraft. This leads to an increased maintenance burden, which can mean higher costs for the provider and potentially decreases aircraft availability. Efforts are made to deliver zero in-service disruption through review of every in-service event and constant risk management to identify emerging reliability threats and reduce their impact. The aim is to balance engine reliability with maintenance burden to ensure optimum service. Worth is also captured for both provider and air force operator through improved return on capital employed by personnel reduction and redeployment.

Warship propulsion support
The support service seeks to minimize the total cost of ownership across a fleet of warships by providing high levels of operational availability and capability, whilst minimizing the cost of operating the vessels. The naval customer has partnered with an industry consortium to achieve these aims as part of a future service provision.

The value proposition is the support of the propulsion system by the multi-organizational enterprise from a technical perspective, targeting capability and empowering the system maintainers while providing a cost-effective solution. The service will achieve a high level of availability across committed platforms with a reduced level of availability across non-committed platforms. It provides technical support via a helpdesk with both remote and local
assistance. Condition monitoring via analysis of available data informs program risk, maintenance need, and inventory decision-making. Knowledge is further transferred via work with training providers. The enterprise that provides the support service is multi-organizational. The service is provided by a partnered organization comprising the naval operator and a consortium of manufacturing firms, but this necessarily draws upon naval personnel and military support services together with a large number of materials, provision, and logistics organizations – both commercial and governmental.

The value will be realized in use as the improvement in a customer’s operational performance. This service has yet to be deployed, but indicators of value are recognized through KPIs: availability (%), capability (%), timely management of significant issues, and customer satisfaction (though the last element is not quantified).

Worth is captured by organizations through payments made for the contracted service. Worth capture for the customer is delivered through cost savings in spares supply, overhaul costs, personnel costs, and level of operational disruption compared with other programs/competitors and is identified and quantified through comparison with calculations of alternative approaches. Savings made as a result of costs lower than a baseline prediction from cost models will be shared jointly with the service provider consortium to incentivize further savings.

Discussion
The three case studies describe the current service offer by large manufacturing engineering firms to provide service capability. The servitization of the firms is illustrated by the transformation described by Ng et al. (2012) from a manufacturing organization transforming materials and equipment to a service provider coordinating the simultaneous transformation of materials and equipment, information, and people and therefore meets the criteria of complex engineering service systems (Ng et al., 2012). The manufactured asset is still evident for all the services in terms of a power unit, representing the transformation of materials and equipment into a functional engine. Provision of that engine is only part of the value proposition.

Creation and delivery of the service proposition is further ‘complicated’ by being offered within the context-laden operating environment of the customer, which in all these cases is global, and hence the contracted services are all global in reach. The offerings all rely heavily on information technology to relay data communications from the engine, giving information on the state of the equipment and the required actions. Data must be transformed into knowledge and then further into advice which is relayed to the customer and supporting facilities to ensure that action is taken, responding rapidly to changing customer context. All three services require both a knowledgeable customer and supplier partners (acting as support and to ensure optimal operation of the asset) to deliver the desired and contracted levels of capability. This requires transformation of people in terms of training.

These particular services have further been identified as CDRS, as classified by Parry et al. (2011). They are particularly challenging offerings, as they are not undertaken in the provider’s environment but are rather services which are created primarily ‘out’ in the customer’s operating environment. From the three cases we can see that the three value elements of the business model have distinct focus and these shall be discussed using the business model value framework: value proposition, value realization, and worth capture.

The value propositions of the three case study services are to offer a capability/availability service. Compared with the traditional model of manufacture focused upon delivery of a manufactured unit, here the unit/asset is still present but the servitized offer is for an operational unit/asset and support for the customer should a problem arise in the use of that asset. Creating the resource base necessary for the service requires a multi-organizational enterprise (Purchase et al., 2011a).
The value proposition is not an extension of the manufacturer’s offer; rather, it is a reconceptualization of the business model. The knowledge required is not an extension of the knowledge base of the manufacture (Ng et al., 2012), but rather requires a paradigm shift in the business model and service enterprise required (Barnett et al., 2013). The three propositions all require much closer working relationships with the provider firms, to the extent that their offer is only made to those customers with whom the provider has sufficiently close relationships and trust already exists.

The value of the service propositions is realized in their use. In the manufacturing model, due to the simultaneous nature of the delivery of the unit and financial reward, value realization and worth capture were considered to be simultaneous. The simultaneity of value exchange and worth capture may have led the firms to believe that value was realized within the exchange, which led to a focus on exchange as the source of worth and the construct that the asset or unit of production was inherently valuable. Resources are not inherently valuable and value can only be realized in use and in context (Ng, 2013). In a complex deployed service the customer uses the service as part of their dynamic operational context. The services allow the customer firm to achieve the desired outcome through the use of their assets. This is consistent with Lapierre et al. (2008), who describe a hierarchical construct of value where customers realize the value of providers’ propositions in order to achieve higher-level ‘end-states.’ Such service propositions are challenging to realize as they operate in the dynamic situated context of the customer’s operational environment. However, the contracted service refocuses the service provider and their partners away from the exchange relationship and onto the value realized in the use of the service.

Worth capture was traditionally at the point of exchange, when a customer bought an asset from a firm. The change in worth capture reflects a change in the perception of value of the customer. In the pre-servitization asset purchase, the asset was valued. Asset value was assessed as an input to the customer process and a decision to purchase or not taken by the customer firm. At the point of purchase exchange, value was realized by the seller. The value of the asset in terms of value realization was not recorded as part of the seller’s asset worth capture, but rather the use of the asset would generate revenue for the provider through sales of spares and servicing only if it failed – a perverse incentive (Bowman and Ambrosini, 2000). In the case studies described, the customers and providers have sought to address this anomaly by jointly benefiting from the successful use of the providers’ assets in the outcome of the customers’ operation. The KPIs ensure that worth capture is contractually linked to these outcomes. In this way, effort to ensure reliability is repaid to the parties who have invested effort, preventing value slippage (Lepak et al., 2007). To ensure that worth is captured, the provider has assumed part of the role traditionally held by the customer (Baines et al., 2011b). The provider must both integrate their operations into the dynamic context of the customer’s environment and act on their behalf. The provider has had to both align with, and in many instances take control over, the customer’s performance management activity. This changes the power dynamic in the relationship, from one of buyer/supplier competing for power by seeking to leverage value from each other, to one where both partners empower each other as both have a vested interest in working to achieve a common goal (Cox, 1999).

Conclusion
This paper builds upon previous literature for business models based on three elements: value proposition, value co-creation, and worth capture (Osterwalder and Pigneur, 2010; O’Cass and Ngo, 2011) and develops a framework for value in business models. Through repeated application by industry, the value framework has become known as business CPR (Capture, Proposition, Realization) and helps managers consider the different interacting aspects of their business model. The work presented here was
undertaken through a process of cooperative enquiry, working with senior managers in the creation of the case studies to help instill in them greater understanding of their business and through the sharing of their knowledge to develop and test service theory. The business models studied were all business-to-business service contracts where the proposition was to achieve an outcome in terms of a realized capability or level of service availability set within the customer’s own dynamic context.

The value framework is used to describe the servitization transformation from the traditional manufacturing business model to the current endpoint of CDRS (Parry et al., 2011b). The new service offers are understood through the lens of service-dominant logic (Vargo and Lusch, 2004, 2008) and center on multiple firms working together to co-create value in the use of resources. The services are interdependent and close relationships are required between all parties in the enterprise (Purchase et al., 2011b) before the services can be offered.

The case studies have demonstrated the utility of the proposed value framework (Figure 1) as a business model which emphasizes the differentiation between value realization and worth capture, allowing servitized manufacturers to more effectively articulate opportunities and competitive advantage. The framework highlights how, through servitization, the new contracted forms have seen the provider taking over some of the traditional roles of the customer (Baines et al., 2011b). This has helped balance the power dynamic (Cox, 1999), as efforts to provide efficient service are repaid to the parties who invest in minimum value slippage (Lepak et al., 2007).

To summarize, the challenges and requirements of CDRS are as follows:

- Providers need to coordinate the simultaneous transformation of materials and equipment, and information (Ng et al., 2012).
- The knowledge required is not an extension of manufacture (Ng et al., 2012).
- Manufacturers require a paradigm shift in their business model to a service enterprise (Barnett et al., 2013).
- Propositions are challenging to realize as they operate in the dynamic situated context of the customer’s operational environment, since value is realized in use and in context (Vargo and Lusch, 2004; Ng, 2013).
- A close working relationship is required.
- Services require a knowledgeable customer and supplier partners.
- Offerings rely heavily upon IT to transfer asset condition data and advice.
- Contracts must avoid perverse incentives which allow worth capture for activities that don’t support value creation (Bowman and Ambrosini, 2000).
- KPIs ensure that worth capture is contractually linked to desired outcomes.

Further research is necessary to identify the extent to which the value framework for the business model and the characterization of CDRS can be generalized to other public/private-sector enterprises that are acknowledged to be highly complex in their functioning, and also to business-to-consumer case examples. Work should examine the requirement and nature of trust in the relationships between the partners in such complex enterprises, particularly how this evolves as the service propositions mature. This work analyzes how business model formulation and implementation impact on value capture. However, it does not analyze the changes in business models over time, a phenomenon known in the literature as ‘business model experimentation’ (Chesbrough, 2010; McGrath, 2010), analysis of which could provide valuable insight into the creation, adaptation, and successful operations management of CDRS.

References

Anderson JC, Narus JA. 1995. Capturing the value of supplementary services. Harvard Business Review 73(1): 75–83.

Angelis J, Edson P. 2011. Shifting from production to service experience based operations. In Macintyre M, Parry G, Angelis...
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J (eds), *Service Design and Delivery*. Springer: New York; pp. 83–94.

Baden-Fuller C, Morgan MS. 2010. Business models as models. *Long Range Planning* **43**(2): 156–171.

Barabási A-L, Bonabeau E. 2003. Scale-free Networks. *Scientific American* **288**(May): 60–69.

Baines TS, Lightfoot HW, Kay JM. 2009. Servitized manufacture: Practical challenges of delivering integrated products and services. *Proceedings of the Institution of Mechanical Engineers. Part B: Journal of Engineering Manufacture* **223**(9): 1207–1215.

Baines TS, Lightfoot HW, Swink M. 2011a. Servitization in action: Findings from a study of the extended Caterpillar enterprise. Proceedings of the EUROMA 2011 Conference, Cambridge, July 3–11, paper 0167.

Baines TS, Lightfoot HW, Smart P. 2011b. Servitization within manufacturing: Exploring the provision of advanced services and their impact on vertical integration. *Journal of Manufacturing Technology Management* **22**(7): 947–954.

Barnett N, Parry G, Saad M, Newnes L, Goh YM. 2013. Servitization – complex engineering service availability: Is a paradigm shift in the business model and service enterprise required? *Strategic Change: Briefings in Entrepreneurial Finance* **11**(3&4): 145–156.

Barney JB, Arikan AM. 2001. The resource-based view: Origins and implications. In MA Hitt, RE Freeman, JS Harrison (Eds.), *Handbook of Strategic Management*. Oxford: Blackwell, pp. 124–188.

Bowman C, Ambrosini V. 2000. Value creation versus value capture: Towards a coherent definition of value in strategy. *British Journal of Management* **11**(1): 1–15.

Chesbrough HW. 2010. Business model innovation: Opportunities and barriers. *Long Range Planning* **43**(2): 354–363.

Cilliers P. 1998. *Complexity and Postmodernism: Understanding Complex Systems*. London: Routledge.

Cox A. 1999. Power, value and supply chain management. *Supply Chain Management: An International Journal* **4**(4): 167–175.

Daliwal JS, Macintyre M, Parry G. 2011. Understanding services and the customer response. In Macintyre M, Parry G, Angelis J (eds), *Service Design and Delivery*. Springer: New York; pp. 1–19.

Demil B, Lecocq X. 2010. Business model evolution: in search of dynamic consistency. *Long Range Planning* **43**(2): 227–246.

Edelman L, Yli-Renko HK. 2010. The impact of environmental and entrepreneurial perceptions on venture creation efforts: Bridging the discovery and creation views of entrepreneurship. *Entrepreneurship: Theory and Practice* **34**(5): 833–884.

Elliot E, Kiel LD. 1997. Nonlinear dynamics, complexity and public policy: Use, misuse, and applicability. In RA Eve, S Horsfall, and EL Lee. *Chaos, Complexity and Sociology: Myths Models and Theories*. London: Sage.

Foley DK. 1996. *Barriers and Bounds to Rationality: Essays on Economic Complexity and Dynamics in Interactive Systems*. Princeton: Princeton University Press.

Heron J. 1996. *Cooperative Inquiry: Research into the human condition*. Sage: London.

Ireland RD, Hitt MA, Sirmon DG. 2003. A model of strategic entrepreneurship: The construct and its dimensions. *Journal of Management* **29**(6): 963–989.

Kao J. 1997. *Jamming: The Art and Discipline of Business Creativity*. Harper Collins: New York.

Kim J, Wilemon D. 2003. Sources and assessment of complexity in NPD projects. *R&D Management* **33**(1): 15–30.

Lapierre J, Tran-Khanh A, Skelling J. 2008. Antecedents of customers’ desired value change in a business-to-business context: Theoretical model and empirical assessment. *Services Marketing Quarterly* **29**(3): 114–148.

Lepak D, Smith KG, Taylor MS. 2007. Value creation and value capture: A multilevel perspective. *Academy of Management Review* **32**(1): 180–194.

Magretta J. 2002. Why business models matter. *Harvard Business Review* **80**(5): 86–92.

Mattyssens P, Vandenbempt K. 1998. Creating competitive advantage in industrial services. *Journal of Industrial and Business Marketing* **13**(4&5): 339–355.

McGrath RG. 2010. Business models: A discovery driven approach. *Long Range Planning* **43**(2): 247–261.

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DOI: 10.1002/jsc
Mills J, Purchase V, Parry G. 2013. Enterprise imaging: Raising the necessity of value co-creation in multi-organizational service enterprises. *International Journal of Operations and Production Management* **33**(2): 159–180.

Neely A. 2008. Exploring the financial consequences of the servitization of manufacturing. *Operations Management Research* **1**(2): 103–118.

Ng I, Parry G, Smith L, Mauull R. 2010. Value Co-creation in Complex Engineering Service Systems: Conceptual Foundations. Proceedings of the Forum on Markets and Marketing (FMM 2010): Extending service-dominant logic, 21–26 September, Cambridge, UK.

Ng ICL. 2013. *Value and Worth: Creating New Markets in the Digital Economy*. Innovorsa Press: Cambridge.

Ng I, Parry G, Smith L, Mauull R, Briscoe G. 2012. Transitioning from a goods-dominant to a service-dominant logic: Visualising the value proposition of Rolls-Royce. *Journal of Service Management* **23**(3): 416–439.

O’Cass A, Ngo L. 2011. Examining the firm’s value creation process: A managerial perspective of the firm’s value offering strategy and performance. *British Journal of Management* **22**(4): 646–671.

Osterwalder A, Pigneur Y. 2010. *Business Model Generation*. Wiley: New York.

Parry G, Newnes L, Huang X. 2011a. Goods, products and services: What do these terms mean? In Macintyre M, Parry G, Angelis J (eds), *Service Design and Delivery*. Springer: New York.

Parry G, McLening M, Caldwell N, Thompson R. 2011b. Complex deployed responsive service. In Macintyre M, Parry G, Angelis J (eds), *Service Design and Delivery*. Springer: New York.

Pighin M. 1998. An empirical quality measure based on complexity values. *Information Software Technology* **40**(14): 861–864.

Prahalad CK, Ramaswamy V. 2000. Co-opting customer competence. *Harvard Business Review* **78**(1): 79–87.

Prahalad CK, Ramaswamy V. 2003. The new frontier of experience innovation. *MIT Sloan Management Review* **44**(4): 12–18.

Priem RL, Butler JE. 2001. Is the resource-based view a useful perspective for strategic management research? *Academy of Management Review* **26**(1): 22–40.

Purchase V, Parry GC, Valerdi R, Nightingale D, Mills J. 2011a. Enterprise transformation: What is it, what are the challenges and why are we interested? *Journal of Enterprise Transformation* **1**(1): 14–40.

Purchase V, Parry G, Mills J. 2011b. Service enterprise transformation. In Ng ICL, Parry GC, Wild P, McFarlane P, Tasker P (eds), *Complex Engineering Service Systems: Concepts and Research*. Springer: London; pp. 25–48.

Ren G. 2009. Service business development in manufacturing companies: Classification characteristics and implications. PhD Dissertation, University of Cambridge.

Sabatier V, Mangematin M, Rousselle T. 2010. From recipe to dinner: Business models portfolios in the European biopharmaceutical industry. *Long Range Planning* **43**(2): 431–447.

Schlick C, Beutner E, Duckwitz S, Licht T. 2007. A complexity measure for new product development projects. Proceedings of the 19th international engineering management conference 2007. IEEE Publishing, Austin, TX, pp. 143–150.

Schuh G, Sauer A, Doering S. 2008. Managing complexity in industrial collaborations. *International Journal of Production Research* **46**(9): 2485–2498.

Slack N, Brandon-Jones A, Johnston R. 2013. *Operations Management*. Pearson: Harlow, Essex.

Taylor R, Tofts C. (2009) *Managing Complex Service Systems*, Springer: New York.

Vandermerwe S, Rada J. 1988. Servitization of business: Adding value by adding services. *European Management Journal* **6**(4): 314–324.

Vargo SL, Lusch RF. 2004. Evolving to a new dominant logic for marketing. *Journal of Marketing* **68**(1): 1–17.
Vargo SL, Lusch RF. 2008. Service-dominant logic: Continuing the evolution. *Journal of the Academy of Marketing Science* 36(1): 1–10.

Zeithaml VA, Parasuraman A, Berry LL. 1985. Problems and strategies in service marketing. *Journal of Marketing* 49(2): 33–46.

Zott C. 2003. Dynamic capabilities and the emergence of intra-industry differential firm performance: Insights from a simulation study. *Strategic Management Journal* 24: 97–125.

Zott C, Amit R, Massa L. 2011. The business model: Recent developments and future research. *Journal of Management* 37(4): 1019–42.

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