Value and servitization; creating complex deployed responsive services[1]

Glenn Parry
Faculty of Business & Law, University of the West of England, Bristol, United Kingdom

Paul Tasker
School of Applied Sciences, Cranfield University, Cranfield, United Kingdom

Correspondence to:

Dr Glenn Parry
Bristol Business School,
University of the West of England,
Frenchay Campus
Bristol, BS16 1QY
United Kingdom
e-mail: glenn.parry@uwe.ac.uk

One sentence summary:

This paper presents a value framework which captures how manufacturing engineering firms are transforming from product to complex service provision where the service is delivered within the customer's dynamic environment and their ability to capture worth is determined by the success of their customer.

Key points:

1. A value framework presents the business models for service transformation which requires managers to consider and capture their value proposition, value realisation and worth capture processes
2. A characterisation of a particular form of service, named complex deployed responsive services [CDRS]
3. CDRS are delivered in partnership with customers, realised off-site and in the customer's environment and must be responsive to their demands such that their success determines the success of the provider.

[1] J.E.L. classification codes: D21 (Firm Behavior); D83 (Search; Learning; Information and Knowledge; Communication; Belief);M21 (Business economics); Z10 Cultural Economics; Economic Sociology; Economic Anthropology: General; B41 (Economic Methodology); E.F.M. classification codes: 760 (Methodological issues)

4. Application of the value framework to a number of business-to-business CDRS has demonstrated its utility in identification and understanding of opportunities for worth capture
5. The proposed framework helps firms consider how to avoid value slippage, which is the process where the value creator is unable to capture the worth from their effort.

1 Introduction

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 commoditised 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 service, previously seen as 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 to 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 realisation 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 realisation is reflected in theory as a goods dominant logic (Vargo and Lusch 2004, 2008).

Service has proven difficult to define but has been characterised as different to product manufacture (Zeithaml et al., 1985) and the realisation of service 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 realised 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 and2003). The competence to create value from service comes from skilful co-ordination of complex resource combinations of products, providers, suppliers and often the customer (Vargo and Lusch 2008; Daliwal et al., 2011; Angelis et al., 2011). Worth may be captured through a fee but payment may be contingent upon the customer realising value from the offer. Therefore the notions of value proposition, realisation and worth capture are different to 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, realisation 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 organisational 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.

2 Servitization

2.1 The Unit of analysis

The transition from product manufacture to a focus upon service activity has been named "servitization" (Vandermerwe and Rada, 1988; Matthyssens and Vandembempt, 1988; Anderson & Narus, 1995). There is an issue with regards 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 start point for a firm's servitization journey, the end point is varied.

The extent of servitization may be conceptualised as reflecting the spectrum of potential service offerings, beginning with a base service offering products and on-going 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; Baines, et al., 2011a). Neely (2008) identifies five categories of product and service offerings which may result from servitization: Product oriented Product-Service System [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 vertically integrate, 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 conceptualised as forwards integration where the focal firm takes over operations of a customer and backwards where they take over operations

of a supplier (Baines et al., 2011b). Neely notes that these services are conceptualised in the language of goods dominant logic (Vargo and Lusch, 2004) where the focus of value is in the exchange relationship as opposed to on a broader understanding of value as co-created with, and for, the parties engaging in the activity (Vargo and Lusch, 2008).

2.2 Complex deployed responsive services

As firms have specialised and focussed on development of their own core competences to create and deliver services they must collaborate with partner firms (Mills et al, 2012). This adds to the complexity of multi-organisational service and raises a particular challenge for managers attempting to co-ordinate 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 manage 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 primarily based not in the provider firm, but out in the customers operating environment (Parry et al., 2011). CDRS have been characterised by recognition of three core interrelated business challenges: geographic coverage, customer demand, 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 Organisations typically divide their geographic area into zones depending upon the scale of the second challenge, customer demand (Parry et al., 2011). Customer demand is challenging for firms new to this service provision as to predict

likely demands require 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 recognise that factors such as sporting events, national holidays, time of day and particularly weather are key drivers of demand. By 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 are deployed. Over time, if complex services can be learning organisations, they are able to exploit their knowledge to become efficient and increasingly cost effective and competitive.

2.3 Challenges of Complexity

One of the key challenges identified involves understanding and managing the complexity experienced in multi-organisational service enterprises (Purchase et al., 2011b). The term complexity is frequently used but is resistant to clear definition and measurement (Foley, 1996; Murmann, 1994; 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 non-linear, 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 behaviour observed locally and the whole system level behaviour which can lead to system level outcomes which can be counterintuitive, named emergence (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 experience the opposite effect. Management of complex services requires organisational structures which are able to provide rigour 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 both environmental, task and customer requirement changes.

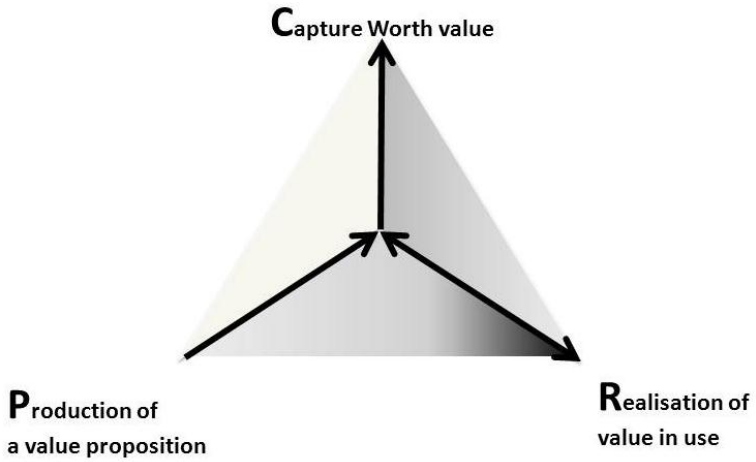
2.4 Value and Business Models

The focus of study for this paper is that of manufactures 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 to 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 focussing on how value is created and worth value is captured sufficient that the firm can achieve greater returns. Business model innovation is considered as the reconfiguring 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

184 further problems arise - Edelman and Yli-Renko (2010). In the extant literature, the emergent
185 deviations to a proposed business model are largely ignored as the business moves from
186 formulation to implementation – (Demil and Lecocq, 2010). It is proposed that the business
187 model is the sum of three interacting elements: the value proposition, value realization and
188 worth capture.
189 Value has been ascribed many meanings and this work will follow Bowman and Ambrosini
190 (2000) who provide a definition which spans many interpretations and proposes that value is
191 the perception of how 'good' something is within a situated context. Value is not a naturally
192 occurring property, but is determined by how it is perceived (Ng et al., 2010). The process of
193 value creation operates across and between the individual, organization and society (Lepak et
194 al., 2007). It is proposed that there are three parts to the value creation process which are;
195 creating a value proposition, value realisation, worth capture (O'Cass and Ngo, 2011;
196 Osterwalder and Pigneur, 2010). The authors have arranged the value elements into a
197 framework , figure 1, which presents the three facets of the business model interacting to
198 form the value creation process.



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200 Figure 1. The three facets of value creation in business models

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, Hitt, and Sirmon, 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 & Arikan, 2001; Priem & Butler, 2001). The resources under a firms control are defined as the resource portfolio and the maximum value creating potential of the firm is defined by its portfolio (Maddock, 2003).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 resource for the benefit of another entity.

The value *Realisation* occurs when the proposition is enacted for the benefit of a customer. The proposition may be a product or services, but the proposition does not create value until the customer uses it, integrating the proposition into their enterprise to realise value. Value is determined by the cost and timing of deployment of resource and is realized through the outcomes achieved through the process of the application of the resource base for a stated benefit (Zott, 2003). Value realisation 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 realisation of the value of a proposition. Worth is usually the monetary exchange; the focus of good dominant logic (Vargo and Lusch, 2004). Sustaining value creation depends upon the producer capturing value sufficient to exceed costs and the amount is determined by the user as a function of their perception of their increased benefit compared to alternates (Lepak et al., 2007). Without these antecedents, the user will not engage in future value realisation and

exchanges, making the business unsustainable. Lepak et al. (2007) use the term value slippage to describe the situation when the value creator is unable to capture worth. Those who create value may find that other individuals, organisations or society benefits more from their efforts than they do. Slippage acts to disincentivize long term value creation.

3 Research 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 the senior managers from the firms involved in providing the services through a method of co-operative enquiry (Heron, 1966). A workshop was held where the theory of the business model and the value framework was explained and materials giving details of the theories from 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, realisation and worth capture. The reports all contained KPIs and an Enterprise Image (Mills et al., 2012), a method for creating a visual depiction of a service enterprise. The image helped to show the organisational resources and business units employed in creating the service and acknowledge both client and service provider roles in enabling behaviours that promote value co-creation (Vargo & Lusch, 2008). Due to commercial sensitivity it is not possible to show 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.

4 Complex Deployed Responsive Service Case Studies

The traditional view of the business model of all the engineering firms was one of manufacture of a unit, undertaken within the firm's facility with contribution from suppliers. With regards 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 realised 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.

4.1 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 organisation 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 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’ and 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 service 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 analytics of their operations, such as any mechanical issues, speed and temperature usage of the asset.

Close interaction with the customer base ensures that analysis provided is fit for purpose. Due to the interdependence of the business process success of the service operation requires a strong customer relationship and close relationships with the supply side partners. The enterprise necessarily draws upon business units in both provider and customer organisations as well as third parties for spares, maintenance provision and logistics. Due 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 maximise 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 more efficiently run their operation 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

297 is in the operator's interest to keep the assets flying and earning revenue for the airline.
298 Operators do not react in a consistent manner to the information presented potentially
299 resulting in unplanned disruption. Education is required to ensure appropriate response is
300 made to all levels of information provided.
301 Worth is captured at multiple levels. Primarily financial worth is captured through payment for
302 the service. The service has mutual dependency and both parties benefit from more efficient
303 operations. Disruption costs money to both operator and provider. Engine failures financially
304 cost the operator in terms of aircraft on the ground and the provider in terms of repair costs.
305 Failures also have a potential reputational cost to both companies. The data collected as part
306 of EHM services allows the OEM to build on its knowledge base, increasing their operational
307 awareness and helping them enhance their service offer in the future, potentially capturing
308 worth from additional customers.

309 *4.2 Military Engine Service*

310 The firm's value proposition is a service contract guaranteeing engine availability to air force
311 operators. The operation of the service requires co-operative working in the front office space
312 and also draws upon numerous resources and business units in both provider and customer
313 organisations back office in addition to third party suppliers. There is a service delivery centre
314 manned by both provider and customer personnel, supported by the provider operations
315 centre and their engine overhaul facility. The on-site technical support includes trouble
316 shooting, EHM and technical policy experts. The contracted goal is to keep engines on the
317 aircraft as long as possible. On-site operations are supported offsite by the firm's operations
318 centre at their manufacturing and service facilities. The offer proposes more predictable
319 operations, shorter turnaround time and greater asset availability for the customer.
320 Value is realised through the use of serviceable engines. The service is delivered through the
321 service delivery centre 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 onsite 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 incentivises 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 the air force operator through improved return on capital employed through personnel reduction and redeployment.

4.3 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 organisational 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 for technical support via a helpdesk with both remote and local assistance. Condition Monitoring via analysis of available data informs programme 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-

organisational. The service is provided by a partnered organisation 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 organisations both commercial and governmental.

The value will be realised in use as the improvement in the customers operational performance. This service has yet to be deployed but indicators of value are recognised through KPIs: Availability %, Capability %, timely management of significant issues, and customer satisfaction, though the last element is not quantified.

Worth is captured by the organisations through the 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 programmes/ 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 jointly shared with the service provider consortium to incentivise further savings.

5 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 organisation transforming materials and equipment to a service provider co-ordinating 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 these cases are global and hence the contracted services are all global in reach. The offerings all rely heavily upon information technology to relay communications of both the data from the engine giving information of the state of equipment's 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 a knowledgeable customer and supplier partners to act as partner in supporting and ensuring optimal operation of the asset to deliver desired and contracted levels of capability. This requires transformation of people in terms of training.

These particular services have been further identified as complex deployed responsive service, previous classified by Parry et al., (2011). These are particularly challenging offerings as they are not undertaken in the providers environment but are rather services which are created primarily 'out' in the customers 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 realisation and worth capture.

The value propositions of the three case study services are to offer a capability/availability service. Compared to the traditional model of manufacture focussed 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 a multi-organisational enterprise is required (Purchase et al., 2011a).

The value proposition is not an extension of the manufacturers offer; rather it is a reconceptualization of the business model. The knowledge required is not an extension of the knowledge base of 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 between the provider firms enterprise, 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 realised in their use. In the manufacturing model, due to the simultaneous nature of the delivery of the unit and financial reward, value realisation 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 realised 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 realised in use and in context (Ng, 2013). In 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 realise the value of providers' propositions in order to achieve higher-level 'end-states'. Such service propositions are challenging to realise 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 realised 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 realised by the seller. The value of the asset in terms of value realisation was not recorded or 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., 2011). 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 taken control over, the customers' 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).

6 Summary and future work

This paper builds upon previous literature for business models based upon three elements; value proposition, value co-creation and worth capture (O'Cass and Ngo, 2011; Osterwalder and Pigneur, 2010) 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, Realisation) and helps managers consider the different interacting aspects of their business model. The work presented here was undertaken through a process of co-operative

444 enquiry, working with senior managers in the creation of the case studies to help instil in them
445 greater understanding of their business and through the sharing of their knowledge develop
446 and test service theory. The business models studied were all business-to-business service
447 contracts where the proposition was to achieve an outcome in terms of a realised capability or
448 level of service availability set within the customers own dynamic context.
449 The value framework is used to describe the servitization transformation from traditional
450 manufacturing business model to the current endpoint of a complex deployed responsive
451 service (Parry et al., 2011b). The new service offers are understood through the lens of service
452 dominant logic (Vargo and Lusch 2004,2008) and centre on multiple firms working together to
453 co-create value in the use of resources. The services are interdependent and close
454 relationships are required between all parties in the enterprise (Purchase et al., 2011b) before
455 the services can be offered.
456 The case studies have demonstrated the utility of the proposed value framework (Figure 1) as
457 a business model which emphasises the differentiation between value realisation and worth
458 capture allowing servitized manufacturers to more effectively articulate opportunities and
459 competitive advantage. The framework highlights how, through servitization, the new
460 contracted forms have seen the provider taking over some of the traditional roles of the
461 customer (Baines et al., 2011). This has helped balance the power dynamic (Cox, 1999) as
462 efforts to provide efficient service are repaid to the parties who invest value slippage is
463 minimised (Lepak et al., 2007).
464 To summaries the challenges and requirement of CDRS:

465 • Providers co-ordinate the simultaneous transformation of materials and equipment,
466 information (Ng et al., 2012)
467 • Knowledge required is not an extension of manufacture (Ng et al., 2012)
468 • Manufacturers require a paradigm shift in the business model to a service enterprise
469 (Barnett et al., 2013).

- Propositions are challenging to realise as they operate in the dynamic situated context of the customer's operational environment, as value is realised in use and in context (Vargo and Lusch, 2004; Ng, 2013)
- Close working relationship are required
- Services require 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 activity which doesn'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 characterisation of complex deployed responsive service 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 analyses how business model formulation and implementation impacts on value capture. However, it does not analyze the changes in business models over time, a phenomena 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, J.C. and Narus, J.A. 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., G., Angelis, J. (Eds), *Service Design and Delivery,* New York: Springer, Chapter 6, 83-94.

497 Baines, T.S., Lightfoot, H.W. and Kay, J.M. 2009. Servitized manufacture: practical challenges of
498 delivering integrated products and services, *Proceedings of the Institution of Mechanical*
499 *Engineers Part B-Journal of Engineering Manufacture*, 223(9): 1207-1215.
500 Baines, T.S., Lightfoot, H.W. and Smart,P. 2011b. Servitization within manufacturing: Exploring the
501 provision of advanced services and their impact on vertical integration, *Journal of Manufacturing*
502 *Technology Management*, 22(7):947 - 954
503 Baines, T.S., Lightfoot, H.W. and Swink, M. 2011a. Servitization in action: findings from a study
504 of the extended Caterpillar enterprise, *Proceedings of the EUROMA 2011 Conference*, July 3-
505 11th Cambridge, paper 0167
506 Barnett, N., Parry, G., Saad, M., Newnes, L. and Goh, Y. M. 2013, Servitization - Complex
507 engineering service availability: Is a paradigm shift in the business model and service
508 enterprise required?, *Strategic Change: Briefings in Entrepreneurial Finance* , 22 (3-4)145-156
509 Bowman, C., and Ambrosini, V. 2000. Value creation versus value capture: Towards a coherent
510 definition of value in strategy. *British Journal of Management*, 11(1): 1–15
511 Chesbrough, H.W., 2010. Business model innovation: opportunities and barriers. *Long Range*
512 *Planning*, 43 (2), 354–363.
513 Cox, A., 1999. Power, value and supply chain management, *Supply Chain Management: An*
514 *International Journal*, 4(4)167-175
515 Daliwal, J.S., Macintyre, M., Parry, G. 2011. Understanding Services and the Customer
516 Response", in Macintyre, M., G., Angelis, J. (Eds), *Service Design and Delivery,* New York:
517 Springer,, Chapter 1, 1-19
518 Heron, J. 1996. Cooperative Inquiry: Research into the human condition. London: Sage.
519 Lepak, D., Smith, K.G., Taylor, M.S. 2007. Value creation and value capture: A multilevel
520 perspective, *Academy of Management Review*, 32(1) 180–194

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

McGrath, R.G., 2010. Business models: a discovery driven approach. *Long Range Planning* 43 (2), 247–261.

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

Ng, I, Parry, G., Smith, L., Maull, 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

Ng, I., Parry, G., McFarlane, D., Tasker, P. 2011. Towards A Core Integrative Framework For Complex Engineering Service Systems in Ng, I., Parry, G., Wilde, P., McFarlane, D., Tasker, P. (Eds) *Complex Engineering Service Systems: Concepts and Research*, London: Springer

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*, New Jersey, John Wiley & Sons Inc.

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*, New York: Springer

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*, New York: Springer

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

546 Prahalad, C.K. Ramaswamy, V. 2003. The new frontier of experience innovation, *MIT Sloan*
547 *Management Review*, 44(4):12–18.
548 Purchase, V., Parry, G.C., Valerdi, R. Nightingale, D. and Mills, J. 2011a. Enterprise
549 Transformation: what is it, what are the challenges and why are we interested?, *Journal of*
550 *Enterprise Transformation*, 1 (1):14-40
551 Purchase, V., Parry, G., Mills, J. 2011b. Service Enterprise Transformation, in Ng, I.C.L., Parry,
552 G.C., Wild, P., Mcfarlane, P., Tasker, P. *Complex Engineering Service Systems: Concepts and*
553 *Research*, London :Springer, Chapter 2, pp25-48
554 Ren, G. 2009. *Service business development in manufacturing companies: Classification*
555 *characteristics and implications*. PhD Dissertation, University of Cambridge
556 Slack, N., Brandon-Jones, A., Johnston, R. 2013 *Operations Management*, Pearson: Harlow
557 Vandermerwe, S., Rada, J. 1988. Servitization of Business: Adding Value by Adding Services,
558 *European Management Journal*, 6(4): 314-324
559 Vargo, S.L., Lusch, R.F. 2008. Service-dominant logic: continuing the evolution, *Journal of the*
560 *Academy of Marketing Science*, 36(1): 1-10
561 Zeithaml, V.A., Parasuraman, A. and Berry, L.L. 1985. Problems and strategies in service
562 marketing, *Journal of Marketing*, 49(2):33-46
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Glenn Charles Parry is Associate Professor of Strategy and Operations Management and works with firms to help them achieve higher performance by redesigning their processes and through making strategic decisions based upon data driven analysis. His work spans music, aerospace, automotive, digital media and construction industries. He has written for international journals and edited the books, "Build to Order: The Road to the 5-day Car", "Complex Engineering Service Systems" and "Service Design and Delivery" - ranked in the IIJ top 20 upcoming design books for innovators.

Paul Tasker is Visiting Professor in Integrated System Design with the University of Kent and Cranfield University where he is also Director, TES Services within the EPSRC National Centre for Through-life Engineering Services. He has an interest in product and service innovation and asset management supporting the development of industrial capability in complex service systems. He is also Chair of the Industrial Advisory Board for WMG's HAT Project.