

1 Value and servitization; creating complex deployed 2 responsive services¹

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15 One sentence summary:

16 This paper presents a value framework which captures how manufacturing

17 engineering firms are transforming from product to complex service provision

18 where the service is delivered within the customer's dynamic environment and their

19 ability to capture worth is determined by the success of their customer.

20 Key points:

21 1. A value framework presents the business models for service transformation
22 which requires managers to consider and capture their value proposition,
23 value realisation and worth capture processes

24 2. A characterisation of a particular form of service, named complex deployed
25 responsive services [CDRS]

26 3. CDRS are delivered in partnership with customers, realised off-site and in the
27 customer's environment and must be responsive to their demands such that
28 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)

- 29 4. Application of the value framework to a number of business-to-business CDRS
30 has demonstrated its utility in identification and understanding of
31 opportunities for worth capture
- 32 5. The proposed framework helps firms consider how to avoid value slippage,
33 which is the process where the value creator is unable to capture the worth
34 from their effort.
- 35

36 **1 Introduction**

37 Servitization highlights the trend in which firms seek to gain revenue by offering fuller market
38 packages or bundles of customer-focused combinations of products and services. Many
39 product offers have become commoditised in the eyes of the end user which has led
40 traditional manufacturing firms in particular to pursue extra revenue downstream through
41 services. For many manufacturers the provision of service, previously seen as additional
42 activity (Ren, 2009), would now appear to be a necessity to maintain financial viability (Neely,
43 2008). This change in business focus and strategy brings about new challenges and
44 opportunities.

45 As manufacturers are 'adding service' there is a tendency in both literature and practice to
46 treat service as an extension of the manufacturing and engineering knowledge base (Ng et al.,
47 2012). However, service and service provision is a very different form of business to
48 manufacture. Manufacturing firms produce a unit and the transformation of materials and
49 equipment undertaken in the production process is normally considered as the value creating
50 activity and the unit of analysis (Slack et al., 2013). The focus of value realisation is at the point
51 of exchange where the unit is sold and worth is captured for the manufacturing firm, usually as
52 money. The customer's use or consumption activity is frequently seen as separate from the
53 manufacturer's value creation activity. A focus on exchange as the point of value realisation is
54 reflected in theory as a goods dominant logic (Vargo and Lusch 2004, 2008).

55 Service has proven difficult to define but has been characterised as different to product
56 manufacture (Zeithaml et al., 1985) and the realisation of service value is often presented as
57 simultaneous with its production. A service provider can only create a proposition for a
58 customer which has potential value as value is only realised when the service is enacted. As
59 service production is simultaneous with its consumption by the customer, customer and
60 supplier firms are proactively involved in the realization of value, a construct described as

61 being 'co-opted' into the design and delivery of services (Prahalad and Ramaswamy, 2000
62 and 2003). The competence to create value from service comes from skilful co-ordination of
63 complex resource combinations of products, providers, suppliers and often the customer
64 (Vargo and Lusch 2008; Daliwal et al., 2011; Angelis et al., 2011). Worth may be captured
65 through a fee but payment may be contingent upon the customer realising value from the
66 offer. Therefore the notions of value proposition, realisation and worth capture are different
67 to those of traditional manufacture. These are the elements of the business model (Baden-
68 Fuller and Morgan, 2010), and past work has suggested that servitization requires a paradigm
69 shift in both the perspective taken by managers and the business model they employ (Barnett
70 et al., 2013).

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

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

84 2 Servitization

85 2.1 *The Unit of analysis*

86 The transition from product manufacture to a focus upon service activity has been named
87 “servitization” (Vandermerwe and Rada, 1988; Matthyssens and Vandembempt, 1988;
88 Anderson & Narus, 1995). There is an issue with regards the unit of analysis when servitization
89 is discussed as although there is a long standing agreement over the definition of
90 products/goods, their characteristics and their production through manufacture, the definition
91 of services has never reached consensus (Parry et al., 2011a). Whilst ‘manufacturer’ frequently
92 forms the start point for a firm’s servitization journey, the end point is varied.
93 The extent of servitization may be conceptualised as reflecting the spectrum of potential
94 service offerings, beginning with a base service offering products and on-going supply of spare
95 parts; intermediate services offering scheduled maintenance and in-field service; and
96 advanced complex services such as customer support or rental type agreements (Baines et al.,
97 2009; Baines, et al., 2011a). Neely (2008) identifies five categories of product and service
98 offerings which may result from servitization: Product oriented Product-Service System [PSS]
99 where ownership of the product is transferred to the customer and product related services
100 are provided; use oriented service systems where ownership of the product is retained by the
101 provider and the customer purchases use, as in lease arrangements; results oriented PSS
102 where the product may disappear entirely and the customer pays for the result, such as voice
103 messaging; Integration oriented PSS where firms seek to add services by going downstream
104 and vertically integrate, such as when an oil company also sells fuel to customers by operating
105 petrol stations; and service oriented PSS which occur when firms build services into their
106 products, such as intelligent health monitoring systems and their associated services. The
107 ‘direction’ of servitization has further been conceptualised as forwards integration where the
108 focal firm takes over operations of a customer and backwards where they take over operations

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

113 2.2 *Complex deployed responsive services*

114 As firms have specialised and focussed on development of their own core competences to
115 create and deliver services they must collaborate with partner firms (Mills et al, 2012). This
116 adds to the complexity of multi-organisational service and raises a particular challenge for
117 managers attempting to co-ordinate the resources employed to deliver the outcome of a
118 service, as they must take a holistic approach, seeing beyond the individual business units and
119 company structures and manage the whole system. The lead provider organization must
120 impose a holistic management perspective on a complex system of interconnected and
121 interdependent activities undertaken by a diverse network of stakeholders (Purchase et al.,
122 2011a). It is this enterprise that in the end delivers the service experience.

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

129 The first challenge relates to the provision of geographic coverage such that the service is able
130 to be in the correct location when required. Depending upon the service offered this may be
131 local, national, regional or global Organisations typically divide their geographic area into
132 zones depending upon the scale of the second challenge, customer demand (Parry et al.,
133 2011). Customer demand is challenging for firms new to this service provision as to predict

134 likely demands require knowledge of the variables which drive demand. The third challenge,
135 meeting demand, requires processes of communication such that the specific service
136 requirement of the customer can be forecast and captured efficiently. Having captured the
137 requirement the most appropriate resources must be deployed to address that specific
138 demand. Managing customer demand becomes easier with time as a record of likely demand
139 linked to environmental factors becomes established. For example, in the UK, the Royal
140 Automobile Club (RAC) provides a national breakdown recovery service for cars. Through
141 analysis of data they recognise that factors such as sporting events, national holidays, time of
142 day and particularly weather are key drivers of demand. By establishing variables for analysis
143 allows prediction of likely demand that enables better demand planning. Further, common
144 failure modes may be captured along with the likely way customers experience and
145 communicate that failure. This knowledge allows for appropriate resources to meet demand
146 are deployed. Over time, if complex services can be learning organisations, they are able to
147 exploit their knowledge to become efficient and increasingly cost effective and competitive.

148 *2.3 Challenges of Complexity*

149 One of the key challenges identified involves understanding and managing the complexity
150 experienced in multi-organisational service enterprises (Purchase et al., 2011b). The term
151 complexity is frequently used but is resistant to clear definition and measurement (Foley,
152 1996; Murmann, 1994; Pighin, 1998; Kim and Wilemon, 2003; Schlick et al., 2007) and there is
153 resistance to clarification of the term if it involves simplification of the concept (Elliot and Kiel,
154 1997; Cilliers, 1998). Complex systems are non-linear, they do not necessarily act in a
155 mechanical way and give outcomes that are sensitive to the initial conditions (Kao 1997).
156 Typically there is a disconnect between the behaviour observed locally and the whole system
157 level behaviour which can lead to system level outcomes which can be counterintuitive,
158 named emergence (Bonabeau, 2003).

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

167 *2.4 Value and Business Models*

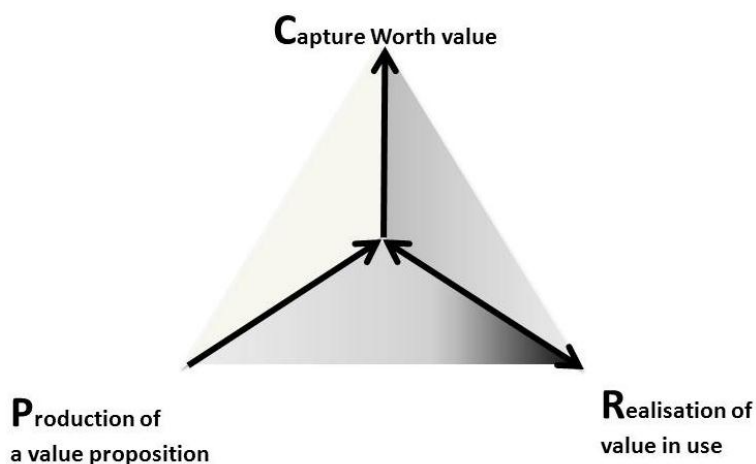
168 The focus of study for this paper is that of manufactures moving to offer service to support an
169 asset and deliver a desired outcome. The contracts put in place are generally either for an
170 assured level of asset availability in service, or are designed to deliver an outcome for the
171 customer. It is proposed that the creation of value through service is different to that of
172 manufacture, due to the level of “co-opted” resource across the extended enterprise, and so a
173 different business model is required.

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

182 Baden-Fuller and Morgan (2010) state that over 66% of firms have not given thought to their
183 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.



199

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

201 The value *Proposition* is the system of valued resource necessary to deliver the purpose of the
202 enterprise and includes materials and equipment, people, information and knowledge (Ireland,
203 Hitt, and Sirmon, 2003; Ng et al., 2011). From a resource based perspective the firm creates its
204 value offering based upon the resources which it is able to coordinate. A portfolio of
205 potentially valuable resources does not mean that a firm can create value (Barney & Arkan,
206 2001; Priem & Butler, 2001). The resources under a firms control are defined as the resource
207 portfolio and the maximum value creating potential of the firm is defined by its portfolio
208 (Maddock, 2003).The value proposition cannot be offered and delivered in all potential
209 contexts. The firm is limited in the number of resources which it may employ and so it is
210 limited as to the value it may offer. Vargo and Lusch (2004, 2008) propose that all propositions
211 (or offerings) are service offerings, where the word service reflects the process of using
212 resource for the benefit of another entity.

213 The value *Realisation* occurs when the proposition is enacted for the benefit of a customer.
214 The proposition may be a product or services, but the proposition does not create value until
215 the customer uses it, integrating the proposition into their enterprise to realise value. Value is
216 determined by the cost and timing of deployment of resource and is realized through the
217 outcomes achieved through the process of the application of the resource base for a stated
218 benefit (Zott, 2003). Value realisation occurs in the specific context of resource use by and for
219 the benefit of the customer firm.

220 Worth *Capture* is the ability of both providers and customers to capture worth following the
221 realisation of the value of a proposition. Worth is usually the monetary exchange; the focus of
222 good dominant logic (Vargo and Lusch, 2004). Sustaining value creation depends upon the
223 producer capturing value sufficient to exceed costs and the amount is determined by the user
224 as a function of their perception of their increased benefit compared to alternates (Lepak et
225 al., 2007). Without these antecedents, the user will not engage in future value realisation and

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

230 **3 Research Methodology**

231 The research uses case studies to capture the business models from three complex deployed
232 services offered by engineering firms. Two of the cases pertain to the military domain, aero
233 engines and surface ships and the third to civilian commercial aero engines. The cases were
234 produced by the senior managers from the firms involved in providing the services through a
235 method of co-operative enquiry (Heron, 1966). A workshop was held where the theory of the
236 business model and the value framework was explained and materials giving details of the
237 theories from literature provided. Guided by the theory the managers then created case
238 materials, providing background on the context of the service and detailed operational
239 information on the three service value elements: production, realisation and worth capture.
240 The reports all contained KPIs and an Enterprise Image (Mills et al., 2012), a method for
241 creating a visual depiction of a service enterprise. The image helped to show the organisational
242 resources and business units employed in creating the service and acknowledge both client
243 and service provider roles in enabling behaviours that promote value co-creation (Vargo &
244 Lusch, 2008). Due to commercial sensitivity it is not possible to show images in this paper.
245 Once complete the cases were presented back to the group and scrutinized in a workshop. The
246 authors then codified the case studies and documented them here.

247 **4 Complex Deployed Responsive Service Case Studies**

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

256 *4.1 Civil Aero Engine Health Monitoring (EHM) Service*

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

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

270 The reactive service provides a non-intrusive direct warning of impending problems to the
271 operator allowing time for them to react before an event which may cause disruption to the

272 service they offer. When a data trend emerges from the data that is deemed 'of interest' and
273 an expert makes a recommendation to the airline to investigate. The action may require the
274 airline, service provider and/or a third party to provide service such as support, logistics,
275 spares etc.

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

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

289 Value is realized through both proactive and reactive offers. The reactive service facilitates the
290 management of any operational issues 'in-service' and in a controlled manner, preventing any
291 unplanned maintenance events. This represents co-created value as the proactive service
292 helps the airline to more efficiently run their operation and hence improve margin. The OEM is
293 able to understand the 'normal' operation of the resources at the fleet level, operator level
294 and individual asset level. This is not without its challenges, not least that not all events evolve
295 through a 'standard pattern'. However, over time accumulated knowledge accelerates the
296 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

322 rapidly and action may be taken on site upon receipt of technical support from either onsite or
323 back office experts.

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

334 *4.3 Warship Propulsion Support*

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

339 The value proposition is the support of the propulsion system by the multi organisational
340 enterprise from a technical perspective, targeting capability and empowering the system
341 maintainers while providing a cost effective solution. The service will achieve a high level of
342 availability across committed platforms with a reduced level of availability across non
343 committed platforms. It provides for technical support via a helpdesk with both remote and
344 local assistance. Condition Monitoring via analysis of available data informs programme risk,
345 maintenance need and inventory decision making. Knowledge is further transferred via work
346 with training providers. The enterprise that provides the support service is multi-

347 organisational. The service is provided by a partnered organisation comprising the naval
348 operator and a consortium of manufacturing firms but this necessarily draws upon naval
349 personnel and military support services together with a large number of materials, provision
350 and logistics organisations both commercial and governmental.

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

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

362 **5 Discussion**

363 The three case studies describe the current service offer by large manufacturing engineering
364 firms to provide service capability. The servitization of the firms is illustrated by the
365 transformation described by Ng et al. (2012) from a manufacturing organisation transforming
366 materials and equipment to a service provider co-ordinating the simultaneous transformation
367 of materials and equipment, information and people and therefore meets the criteria of
368 complex engineering service systems (Ng et al., 2012). The manufactured asset is still evident
369 for all the services in terms of a power unit, representing the transformation of materials and

370 equipment into a functional engine. Provision of that engine is only part of the value
371 proposition.

372 Creation and delivery of the service proposition is further 'complicated' by being offered
373 within the context laden operating environment of the customer, which in these cases are
374 global and hence the contracted services are all global in reach. The offerings all rely heavily
375 upon information technology to relay communications of both the data from the engine giving
376 information of the state of equipment's and the required actions. Data must be transformed
377 into knowledge and then further into advice which is relayed to the customer and supporting
378 facilities to ensure that action is taken, responding rapidly to changing customer context. All
379 three services require a knowledgeable customer and supplier partners to act as partner in
380 supporting and ensuring optimal operation of the asset to deliver desired and contracted
381 levels of capability. This requires transformation of people in terms of training.

382 These particular services have been further identified as complex deployed responsive service,
383 previous classified by Parry et al., (2011). These are particularly challenging offerings as they
384 are not undertaken in the providers environment but are rather services which are created
385 primarily 'out' in the customers operating environment. From the three cases we can see that
386 the three value elements of the business model have distinct focus and these shall be
387 discussed using the business model value framework; value proposition, value realisation and
388 worth capture.

389 The value propositions of the three case study services are to offer a capability/availability
390 service. Compared to the traditional model of manufacture focussed upon delivery of a
391 manufactured unit, here the unit/asset is still present but the servitized offer is for an
392 operational unit/asset and support for the customer should a problem arise in the use of that
393 asset. Creating the resource base necessary for the service a multi-organisational enterprise is
394 required (Purchase et al., 2011a).

395 The value proposition is not an extension of the manufacturers offer; rather it is a
396 reconceptualization of the business model. The knowledge required is not an extension of the
397 knowledge base of manufacture (Ng et al., 2012) but rather requires a paradigm shift in the
398 business model and service enterprise required (Barnett et al., 2013). The three propositions
399 all require much closer working relationships between the provider firms enterprise, to the
400 extent that their offer is only made to those customers with whom the provider has
401 sufficiently close relationships and trust already exists.

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

417 Worth capture was traditionally at the point of exchange, when a customer bought an asset
418 from a firm. The change in worth capture reflects a change in the perception of value of the
419 customer. In the pre-servitization asset purchase the asset was valued. Asset value was

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

437 **6 Summary and future work**

438 This paper builds upon previous literature for business models based upon three elements;
439 value proposition, value co-creation and worth capture (O'Cass and Ngo, 2011; Osterwalder
440 and Pigneur, 2010) and develops a framework for value in business models. Through repeated
441 application by industry the value framework has become known as business CPR (Capture,
442 Proposition, Realisation) and helps managers consider the different interacting aspects of their
443 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).

- 470 • Propositions are challenging to realise as they operate in the dynamic situated context
471 of the customer’s operational environment, as value is realised in use and in context
472 (Vargo and Lusch, 2004; Ng, 2013)
473 • Close working relationship are required
474 • Services require knowledgeable customer and supplier partners
475 • Offerings rely heavily upon IT to transfer asset condition data and advice
476 • Contracts must avoid perverse incentives which allow worth capture for activity which
477 doesn’t support value creation (Bowman and Ambrosini, 2000)
478 • KPIs ensure that worth capture is contractually linked to desired outcomes

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

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