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Capability Framework Implementing Pay-Per-Outcome Business Model in Equipment Manufacturing Companies

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Abstract

The primary objective of this paper is to enhance our understanding of the capabilities necessary for implementing a pay-per-outcome business model and how equipment manufacturing companies can successfully implement such a business model. Based on systematic literature research, we analysed 12 research publications that discussed pay-per-outcome capabilities in the equipment manufacturing industry. We identified 36 capabilities and formulated a capability framework for pay-per-outcome business models in the equipment manufacturing industry. We also identified that pay-per-outcome business models require specific capabilities related to customer relationship and contracting, compared with other service-based business models (such as pay-per-use business models). Since earlier studies have failed to distinguish the capabilities necessary for pay-per-outcome business models from those for other types of product-service system business models or focused on some specific required capabilities for the former business models, we contribute to current business model literature by uncovering the unique characteristics of pay-per-outcome business models in the equipment manufacturing industry.

Keywords: Pay-per-outcome, Capabilities, Equipment manufacturing

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Introduction

In recent years, sustainable business models such as pay-per-x (PPX) business models (BMs) have gained interest among the equipment manufacturing industry (EMI) as companies try to increase their profitability and find competitive advantage by shifting from product-orientated towards service-orientated business (Cuc, 2019; Gebauer et al., 2017). In PPX BMs, the customer pays depending on equipment usage, such as by used hours (pay-per-use), kilometres (pay-per-output) or produced outcomes (pay-per-outcome), rather than buying the equipment (Menon et al., 2019). In PPX BMs, consumers pay for the unit of service (e.g. clothes wash) without gaining product ownership, and thus they are often linked to increased environmental performance (Tunn et al., 2020). PPX BMs are reasonably popular in the energy industry where the customer does not own e.g. solar panels but pay only based on how much energy the panels generate (Xu et al., 2018). Another example may be a compressed air and vacuum products manufacturer offering customers a fixed price per cubic meter of compressed air. PPX services require the value proposition to be reconfigured from products (input-orientated) to services (output-orientated) (Cusumano et al., 2015). PPX BMs allow the customer to move capital costs to operational costs, while the supplier carries the operational risks. This risk transfer is priced, and thus central in PPX BMs (Adrodegari et al., 2015). Pay-per-outcome BMs are the most advanced version of PPX BMs; there are various terms for these in the literature, such as outcome-based contracts (Ng et al., 2009), performance-based contracts (Liinamaa et al., 2016) and result-orientated product-service systems (Möller and Shahnavaz, 2020). Furthermore, the meaning of a pay-per-outcome BM varies among authors, and some do not even distinguish between pay-per-use and pay-per-outcome BMs (Grubic and Jennions, 2018). In pay-per-outcome BMs, the customer pays for the results the product/service provides, rather than for usage of products, while the ownership of product and maintenance responsibilities remains with supplier (Gebauer et al., 2017). The customer pays a fee, which depends on the achievement of a contractually set result in terms of product performance or outcome of its usage (for instance, the final output quality) (Adrodegari et al., 2015). For

example, with independent power producer contracts, the customer neither buys the energy facility nor leases it but commits to buying a fixed amount of energy (Mwh) at a pre-defined price. Thus, the provider (or third party) owns the facility, and if the provider can produce excess energy, it gains the profits from that. If it cannot produce the agreed level of energy, however, it will have to buy the necessary energy from the markets (Korkeamäki and Kohtamäki, 2019).

Despite the popularity of pay-per-outcome BMs, their implementation has been difficult due to significant risks and technological challenges (Gebauer et al., 2017). These difficulties may prevent the implementation of such BMs in equipment manufacturing companies. Michelin, for example, had endured many years challenges to attain a commercially successful pay-per-kilometre service; it finally succeeded only after it was able to develop new monitoring and service development capabilities (Gebauer et al., 2017).

To successfully implement a pay-per-outcome BM, a company needs to reconfigure its current capabilities (Teece, 2018) and develop new ones (Grubic and Jennions, 2018). The needed capabilities related product-service systems as wider concept have already been researched (Annarelli et al., 2021), but only a few studies have considered the capabilities needed specifically for PPX BMs (Gebauer et al., 2017; Möller and Shahnavaz, 2020; Sousa-Zomer et al., 2018; Story et al., 2017). However, these studies do not take into account the specific capabilities needed for pay-per-outcome BMs such as those related to customer co-production (Schaeffers et al., 2021) or legal-technical capabilities related to contracting (Ng and Nudurupati, 2010).

Hence the primary objective of this paper is to fill this gap related to the capabilities required for pay-per-outcome BMs and to understand how equipment manufacturing companies can successfully implement such models. Thus, we aim to answer the following research question:

RQ: What kind of new capabilities are needed for implementing pay-per-outcome business models in the equipment manufacturing industry?

To answer the research question, we have used a systematic literature review approach. Based on the articles, we have identified the necessary capabilities and formulated a capability framework for pay-per-outcome BMs in the EMI.

Since earlier studies have either failed to distinguish the capabilities required for pay-per-outcome BMs from other types of product-service system BMs or focused on some specific capability required for pay-per-outcome BMs, we contribute to current BM literature by uncovering the unique characteristics pay-per-outcome BMs in the EMI.

Approach

This study adopted a systematic literature approach (Kitchenham, 2004). In research carried out during June 2021, we searched only for journal articles written in English and published in the Scopus and Web of Science databases. As our research topic was capabilities of pay-per-outcome BMs in the EMI, we used the following keywords and search string: ("pay per output" OR "pay per outcome" OR

"outcome-based" OR "performance-based" OR "performance-based logistics" OR "performance-based contract" OR "product service systems" OR "product service systems business model" OR "result-oriented" OR "servitization" OR "advanced service") AND ("manufacturing" OR "manufacture" OR "manufacturer" OR "machine builder" OR "equipment") AND ("capabilities" OR "capability" OR "competencies" OR "competences"). In total, we identified 260 articles from Scopus and 236 from Web of Science; after removing duplicates, we were left with 327 journal articles. After screening records by title and/or abstract, we reduced the amount to 32 articles that specifically discussed pay-per-outcome BMs in EMI. These articles were studied carefully, and from them we finally identified 9 articles eligible for our study. In addition, we complemented the identified articles with a search by Google Scholar and a backward search from references that revealed 2 articles and 1 conference paper published in a *Procedia CIRP* special issue. The conference paper was included due to its interesting viewpoint on co-production and financing. Thus, we commenced our review with 12 articles (See Table 1).

Table 1.

Article	Journal	Perspective for capabilities	Reference
1. Outcome-based contracting from the customers' perspective: a means-end chain analytical exploration	Industrial Marketing Management	Service development and customer relationship perspective	(Schaefers et al., 2021)
2. The role of servitization in the capabilities-performance path	Competitiveness Review	Digitalisation and organisational capability perspective	(Manresa et al., 2021)
3. To outcomes and beyond: discursively managing legitimacy struggles in outcome business models	Industrial Marketing Management	Co-production perspective	(Korkeamäki and Kohtamäki, 2020)

Table 1: Selected articles (Continued)

Table 1.

Article	Journal	Perspective for capabilities	Reference
4. Ecosystem of outcome-based contracts: a complex of economic outcomes, availability and performance	Procedia CIRP	Co-production and financing perspective	(Korkeamäki and Kohtamäki, 2019)
5. Investigating risks of outcome-based service contracts from a provider's perspective	International Journal of Production Research	Customer relationship and contracting perspective	(Hou and Neely, 2018)
6. The path to outcome delivery: interplay of service market strategy and open business models	Technovation	Service development perspective	(Visnjic et al., 2018)
7. Servitization through outcome-based contract – a systems perspective from the defence industry	International Journal of Production Economics	Customer relationship and value network perspective	(Batista et al., 2017)
8. Performance-based and functional contracting in value-based solution selling	Industrial Marketing Management	Contracting perspective	(Liinamaa et al., 2016)
9. Servitized manufacturing firms competing through remote monitoring technology: an exploratory study	Journal of Manufacturing Technology Management	Digitalisation perspective	(Grubic and Peppard, 2016)
10. Pricing strategies of service offerings in manufacturing companies: a literature review and empirical investigation	Production Planning & Control	Financing perspective	(Rapaccini, 2015)
11. Outcome-based service contracts in the defence industry – mitigating the challenges	Journal of Service Management	Customer relationship and value network perspective	(Ng and Nudurupati, 2010)
12. Outcome-based contracts as a driver for systems thinking and service-dominant logic in service science: evidence from the defence industry	European Management Journal	Organisational capability perspective	(Ng et al., 2009)

Table 1: Selected articles

The thematic analysis was used to identify capabilities from the literature (Corbin and Strauss, 2008). It was conducted in two stages: in the first stage, we identified the necessary resources, activities and knowledge described in the articles, and in the second phase, we categorised these thematic items into capabilities (Day, 1994). For example, according to Rapaccini (2015), complex services such as pay-per-outcome services should be priced based on the value they provide for the customer rather than on the costs they generate. We interpret from this that pay-per-outcome BMs require 'capability to quantify the value provided by the offer'.

Key Insights

We identified 36 capabilities that we divided to seven dimensions, thus creating the framework (Table 2). The dimensions were based on business activities-derived servitisation frameworks found in the literature (Sousa-Zomer et al., 2018; Story et al., 2017), but they were modified to address the key characteristics of pay-per-outcome BMs, such as customer relationship and digitalisation, which were emphasised in the identified capabilities. In the following sub-sections, we describe each of these dimensions in more detail.

Table 2.

Dimension	Capabilities	Differences compared to pay-per-use BM
Customer relationship	<ul style="list-style-type: none"> – Capability to establish trustworthy relationships with customers (Korkeamäki and Kohtamäki, 2020) – Capability for transparent interorganisational communication (Korkeamäki and Kohtamäki, 2020) – Capability to co-develop with customers (Schaefers et al., 2021) – Capability for co-production with customers (Schaefers et al., 2021) – Capability to communicate new roles and responsibilities among customers' BMs (Hou and Neely, 2018) – Understanding customer needs (Hou and Neely, 2018; Visnjic et al., 2018) – In-depth understanding of customer processes (Korkeamäki and Kohtamäki, 2020; Schaefers et al., 2021) – Capability to convince customers about the value of non-ownership BM (Korkeamäki and Kohtamäki, 2020; Schaefers et al., 2021) 	<ul style="list-style-type: none"> – Capability for co-production with customer (Schaefers et al., 2021) – Understanding customer needs (Hou and Neely, 2018; Visnjic et al., 2018) – In-depth understanding of customer processes (Korkeamäki and Kohtamäki, 2020; Schaefers et al., 2021)
Value network	<ul style="list-style-type: none"> – Capability to identify and analyse relevant partners (Ng et al., 2013) – Capability to evaluate partner's performance (Hou and Neely, 2018) – Capability to orchestrate the value network of partners (Hou and Neely, 2018) 	<ul style="list-style-type: none"> – Capability to evaluate partner's performance (Hou and Neely, 2018)
Digitalisation	<ul style="list-style-type: none"> – Capability for remote monitoring (Grubic and Peppard, 2016) – Capability to convince the customer to share data (Grubic and Peppard, 2016) – Capability to translate data into value (Grubic and Peppard, 2016) – Capability to ensure data privacy and security (Grubic and Peppard, 2016) – Capability to simulate equipment performance (Grubic and Peppard, 2016) 	<ul style="list-style-type: none"> – Capability to simulate equipment performance (Grubic and Peppard, 2016)

Table 2: Pay-per-outcome business model (BM) capability framework. (Continued)

Table 2.		
Dimension	Capabilities	Differences compared to pay-per-use BM
Organisation and governance	<ul style="list-style-type: none"> – Service-orientated attitude (Ng et al., 2009) – Capability to quantify, control and monitor risks (Ng et al., 2009) – Capability to quickly react to fast-changing situations (Ng et al., 2009) – Capability to establish a continuous learning culture (Ng et al., 2009) – Leadership (Ng et al., 2009) – Teamwork (Ng et al., 2009) – Technical competencies for marketing personnel (Schaefers et al., 2021) 	<ul style="list-style-type: none"> – Technical competencies for marketing personnel (Schaefers et al., 2021)
Contracting and legal	<ul style="list-style-type: none"> – Legal-technical capabilities (Ng and Nudurupati, 2010) – Capability to negotiate value-based contracts (Liinamaa et al., 2016) – Capability to manage intellectual property and tacit knowledge (Liinamaa et al., 2016) – Capability for functional contractual techniques (Liinamaa et al., 2016) 	<ul style="list-style-type: none"> – Legal-technical capabilities (Ng and Nudurupati, 2010) – Capability to manage intellectual property and tacit knowledge (Liinamaa et al., 2016) – Capability for functional contractual techniques (Liinamaa et al., 2016)
Service development	<ul style="list-style-type: none"> – Capability to quantify the value provided by the offer (Liinamaa et al., 2016; Rapaccini, 2015) – Definition of logistics and distribution processes (Korkeamäki and Kohtamäki, 2019) – Definition of installation and maintenance services procedures (Korkeamäki and Kohtamäki, 2019) – Capability to develop processes for reverse logistics and remanufacturing (Schaefers et al., 2021) – Understanding of service design (Schaefers et al., 2021) – Capability to anticipate potential causes of product failure (Schaefers et al., 2021) 	<ul style="list-style-type: none"> – Capability to anticipate potential causes of product failure (Schaefers et al., 2021)
Financing	<ul style="list-style-type: none"> – Capability to finance non-ownership BM (Rapaccini, 2015) – Capability to calculate life-cycle cost of product-service systems (Rapaccini, 2015) – Capability to convince financial partners (Korkeamäki and Kohtamäki, 2019) 	<ul style="list-style-type: none"> – Capability to convince financial partners (Korkeamäki and Kohtamäki, 2019)

Table 2: Pay-per-outcome business model (BM) capability framework.

Customer relationship

In pay-per-outcome BMs, the provider's profitability is dependent on the outcome of the customer's process (Korkeamäki and Kohtamäki, 2019). Hence, the role of the customer relationship is emphasised, and without mutual trust between the provider and customer, the pay-per-outcome BM is doomed to fail (Korkeamäki and Kohtamäki, 2020). The trust is built on fairness and honesty (Korkeamäki and Kohtamäki, 2020), which can be ensured through deep partnership with the customer and fair profit-sharing (Korkeamäki and Kohtamäki, 2019). Sometimes it can be beneficial to reveal the weak points of an offering, to give the customer a feeling of openness and honesty (Schaefers et al., 2021). In addition, mutual expectations should be realistic and possible to keep (Ng and Nudurupati, 2010). Above all, to prove the credibility of the service, references have a significant role in pay-per-outcome BMs (Schaefers et al., 2021).

Furthermore, capability for co-production is crucial in pay-per-outcome BMs, since performance increases can only be achieved that way. For example, one interviewee in Schaefers et al.'s (2021) study remarked that if they notice that the customer is not committed on co-production, it is no worth pursuing (Schaefers et al., 2021). Similarly, Liinamaa et al. (2016) showed how one company failed to deliver a profitable pay-per-outcome service because it could not adapt to its customer's processes. The provider did not gain access to the customer's business data and knowledge that it would have needed to improve its process performance (Liinamaa et al., 2016). However, when the complexity of the process and number of parties involved in it increase, it is not uncommon for the ownership of many of the activities to become unclear (Batista et al., 2017). Thus, defining clear roles and responsibilities for each party is also essential in pay-per-outcome BMs (Hou and Neely, 2018).

Proving the value for the customer in pay-per-outcome BMs is difficult, and to do that, the provider must understand the customer's needs (Hou and Neely, 2018; Visnjic et al., 2018), how its business works and how decisions in the customer's organisation are made (Liinamaa et al., 2016). When the

provider and the customer do not understand each other, the customer might start to demand more things for the contract until the contract ends up being too complicated to be implemented (Hou and Neely, 2018). Furthermore, Hou and Neely (2018) showed that customer demands might vary between and even within countries and regions depending on business environment and business drivers. For example, in a case study introduced by Liinamaa et al. (2016), the customer's earning logic was such that any performance increase would not have benefited the customer but its partners, which thereby would not encourage the customer to buy the service as such. Thus, understanding the customer's unique needs is crucial for the success of a pay-per-outcome BM.

However, to understand the value its equipment creates, the provider must have an in-depth understanding of the customer's processes (Korkeamäki and Kohtamäki, 2020); it must understand the role in its process the offering plays (Korkeamäki and Kohtamäki, 2020) and how the whole system works together (Schaefers et al., 2021). Without understanding the entire process, it would be hard to make the best out of it. Both Korkeamäki and Kohtamäki (2020) and Schaefers et al. (2021) emphasised that even salespeople must have a technical understanding of the process, so that they can credibly communicate the value created by the equipment.

Value network

The performance of a system can be improved internally only up to a certain point. After that, it becomes essential to collaborate with other value network parties (Korkeamäki and Kohtamäki, 2020). In pay-per-outcome BMs, collaboration with partners quite often becomes inevitable because earning logic is based on improvements in the system. To get the most out of this kind of such partnerships, all the parties must be able to efficiently share knowledge and resources with each other as well as align their BMs, which might not always be easy (Korkeamäki and Kohtamäki, 2020). Thus, successful pay-per-outcome BMs usually need partnering capabilities, such as to identify and evaluate partners.

Furthermore, incorporating third parties for delivering a value proposition constitutes a risk because if

some partner cannot deliver what it has promised, it might compromise the outcome of the entire offering (Hou and Neely, 2018). Thus, it is also necessary for the provider to have the capability to orchestrate the partner network and mitigate possible risks related to it.

Digitalisation

In pay-per-outcome BMs, equipment requires remote monitoring capability and data connection (Grubic and Peppard, 2016). For example, monetisation is based on performance improvements, and remote monitoring capabilities are needed to measure that. Thus, the provider must be able to convince the customer to share data and do so in a secure way (Grubic and Peppard, 2016).

Secondly, the provider must be able to estimate performance improvements in advance so that it can define the proper risk premium for its offering. Without that, it cannot price the offering or provide guarantees related to performance (Liinamaa et al., 2016). Therefore, simulation capability is emphasised especially in pay-per-outcome BMs (Liinamaa et al., 2016; Rapaccini, 2015). However, investment in simulation capability may be costly, since the provider should be able to take into account, for example, market conditions, business environment and the customer's activities while estimating performance (Liinamaa et al., 2016).

Organization and governance

The role of human capacity and capability is significant in complex service systems (Ng et al., 2009). Therefore, the success of pay-per-outcome BMs is also dependent on organisational capabilities (Manresa et al., 2021). A company implementing a pay-per-outcome BM needs organisational capabilities such as coordinating and leading people in a changing environment, working in teams and forming relationships, quantifying, controlling, and monitoring risks, reacting quickly to fast-changing situations and establishing a continuous learning culture (Ng et al., 2009).

Furthermore, an organisation must be able to define and communicate clear roles for both its own personnel and interorganisational personnel. It must also be able to reduce uncertainty and the feeling of

loss of control while organisational boundaries fade between the provider and customer (Ng and Nudurupati, 2010).

Lastly, pay-per-outcome BMs require the removal of silos and broken borders within an organization (Korkeamäki and Kohtamäki, 2020). Engineers need to have soft skills such as teamwork and leadership (Ng and Nudurupati, 2010), and marketing personnel must have technical skills to be able to convince customers about the performance potential of the offering (Schaeffers et al., 2021).

Contracting and legal

The successful implementation of a pay-per-outcome BM is highly dependent on contracts (Liinamaa et al., 2016). Pay-per-outcome contracts are complex, and negotiating them requires a new kind of legal-technical capability (Ng and Nudurupati, 2010); thus, many companies fail to implement pay-per-outcome BMs (Liinamaa et al., 2016). According to Liinamaa et al. (2016), the contract should be considered a key sales object, and salespeople should have the capability to negotiate value-based contracts (Liinamaa et al., 2016).

Negotiating pay-per-outcome contracts takes a lot of time, and even years (Korkeamäki and Kohtamäki, 2020, 2019). The contract should be clear, unambiguous and verifiable, and it should contain the responsibilities of both parties (Liinamaa et al., 2016). However, Korkeamäki and Kohtamäki (2020) remarked that a contract that is too may might decrease 'goodwill-based trust' between the customer and provider.

Earnings in pay-per-outcome BMs are based on exceeding pre-defined performance levels. Defining this baseline is a crucial activity in contract negotiation (Liinamaa et al., 2016); however, it is far from easy. The baseline should be defined mathematically in consideration of the risks, customer environment (Korkeamäki and Kohtamäki, 2019), equipment capabilities, market conditions and value created for the customer (Liinamaa et al., 2016). Therefore, negotiating the contract requires technical capabilities among the all negotiating partners (Schaeffers et al., 2021).

Above all, managing intellectual property (IP) and tacit knowledge in pay-per-outcome BM delivery is crucial because performance improvements are quite often based on these. For example, Liinamaa et al. (2016) showed how the case company was forced to reveal its technical plans to prove the value of its service, and the customer used this opportunity to forward this knowledge to the case company's competitor to get the same service for a lower price (Liinamaa et al., 2016). Without proficient IP management capabilities, there is nothing to restrict the customer from exploiting this knowledge (Korkeamäki and Kohtamäki, 2020). Thus, Liinamaa et al. (2016) proposed that the company should have a contracting technique whereby the ownership of IP rights is negotiated before it reveals more detailed technical plans.

Service development

According to Rapaccini (2015), complex services such as pay-per-outcome services should be priced based on the value they provide for the customer rather than costs they generate. For example, Liinamaa et al. (2016) argued that most PPX types of BM in the literature, such as Rolls-Royce's Power-by-the-Hour, are rather simple and based on used hours alone rather than the actual value they provide. Hence, in a pay-per-outcome BM, the company needs the capability to quantify the value it provides for the customer.

Secondly, as in pay-per-outcome BMs, when the provider is responsible for equipment throughout its life-cycle, the life-cycle costs are emphasised (Schaefers et al., 2021). The company must be able to anticipate potential equipment failures, understand the processes for reverse logistics and remanufacturing and know how to optimise equipment life-cycle costs so it can price the service correctly (Schaefers et al., 2021). Maintenance activities in particular are crucial in pay-per-outcome BMs, and with well-defined maintenance, logistics and distribution processes, the company can create a competitive advantage (Korkeamäki and Kohtamäki, 2019).

Financing

Pay-per-outcome BMs always have a financial risk due to the upfront investments the provider must

make, and realising the value is usually a lengthy process (Hou and Neely, 2018). Thus, the company must have the financial capability to carry out this upfront investment and undertake the risk that the outcome might not always be realised. In addition, specific pricing capabilities are needed, since the pay-per-outcome BM is based on pricing possible performance increases and the related risk premium (Rapaccini, 2015).

The provider does not always need to carry the entire financial risk alone, and it can outsource it to financial partners (Korkeamäki and Kohtamäki, 2019). However, in that case, the provider must have the capability to convince financial partners about the profitability of the pay-per-outcome BM and communicate it in financial terms (Korkeamäki and Kohtamäki, 2019).

Discussion and Conclusions

This study provides evidence about the new capabilities needed for implementing pay-per-outcome BMs. We identified 36 capabilities and grouped them to 7 dimensions to show that there are indeed differences between pay-per-use and pay-per-outcome BMs. With this, we contribute to the existing BM innovation and PPX literature by showing that pay-per-outcome BMs do need additional capabilities compared with more traditional pay-per-use types of BM.

We showed that although customer relationships have a significant role in pay-per-use BMs (Gebauer et al., 2017; Möller and Shahnavaz, 2020; Sousa-Zomer et al., 2018; Story et al., 2017), such BMs require an even closer relationship with the customer and much more in-depth understanding of its processes and business, since the provider's revenues are dependable on improvements in the customer's process. Close relationship with customer enable gaining the customer data (Luoma et al., 2021) which is necessity for the pay-per-outcome business models. In addition, we showed that pay-per-outcome BMs require a new kind of capabilities related to contracting, as pay-per-outcome contracts are much more complex and require technical

definitions of accepted performance levels. Thus, it is important for pay-per-outcome BMs to be studied separately from pay-per-use BMs rather than being grouped together as similar BMs.

Secondly, even though previous studies (Gebauer et al., 2017; Möller and Shahnava, 2020; Sousa-Zomer et al., 2018; Story et al., 2017) have created capability frameworks for PPX BMs, they have failed to distinguish between the different types of PPX BM. As the capabilities of these models differ in essential ways, it is necessary to have a pay-per-outcome-focused capability framework that emphasises its peculiarities. Thus, we contribute by developing a capability framework specifically for pay-per-outcome BMs in the EMI.

The study also has a practical contribution. We identified the capabilities that a company requires to implement a pay-per-outcome BM and provided insight into why these capabilities are so important and what a lack of them can lead to. Practitioners can utilise the presented framework while developing such BMs.

Finally, as in any study, this one has its own limitations. The most obvious relates to the selected methodology, which is a systematic literature review. The capability framework was developed based on existing literature that might not have identified all the required capabilities. In addition, it is always possible that we have missed some literature during our review process. However, the current study was able to create a quite extensive but generic capability framework that should be tested with empirical data through future research. Secondly, as we tried to create an overall picture of the required capabilities, we could not focus too deeply on individual dimensions. This creates fertile ground for future research to study how companies should develop such individual capabilities.



References

- Adrodegari, F., Alghisi, A., Ardolino, M., Saccani, N., 2015. From ownership to service-oriented business models: A survey in capital goods companies and a PSS typology. *Procedia CIRP* 30, 245-250. <https://doi.org/10.1016/j.procir.2015.02.105>
- Annarelli, A., Battistella, C., Costantino, F., Di Gravio, G., Nonino, F., Patriarca, R., 2021. New trends in product service system and servitization research: A conceptual structure emerging from three decades of literature. *CIRP J. Manuf. Sci. Technol.* 32, 424-436. <https://doi.org/10.1016/j.cirpj.2021.01.010>
- Batista, L., Davis-Poynter, S., Ng, I., Maull, R., 2017. Servitization through outcome-based contract – A systems perspective from the defence industry. *Int. J. Prod. Econ.* 192, 133-143. <https://doi.org/10.1016/j.ijpe.2016.12.005>
- Corbin, J., Strauss, A., 2008. Analyzing Data for Concepts, in: *Basics of Qualitative Research (3rd Ed.): Techniques and Procedures for Developing Grounded Theory*. SAGE Publications, Inc., 2455 Teller Road, Thousand Oaks California 91320 United States. <https://doi.org/10.4135/9781452230153>
- Cuc, J.E., 2019. Trends in Business Model Research: A Bibliometric Analysis. *J. Bus. Models* 7, 24.
- Cusumano, M.A., Kahl, S.J., Suarez, F.F., 2015. Services, industry evolution, and the competitive strategies of product firms. *Strateg. Manag. J.* 36, 559-575. <https://doi.org/10.1002/smj.2235>
- Day, G.S., 1994. The Capabilities of Market-Driven Organizations. *J. Mark.* 58, 17. <https://doi.org/10.2307/1251915>
- Gebauer, H., Saul, C.J., Haldimann, M., Gustafsson, A., 2017. Organizational capabilities for pay-per-use services in product-oriented companies. *Int. J. Prod. Econ.* 192, 157-168. <https://doi.org/10.1016/j.ijpe.2016.12.007>
- Grubic, T., Jennions, I., 2018. Do outcome-based contracts exist? The investigation of power-by-the-hour and similar result-oriented cases. *Int. J. Prod. Econ.* 206, 209-219. <https://doi.org/10.1016/j.ijpe.2018.10.004>
- Grubic, T., Peppard, J., 2016. Servitized manufacturing firms competing through remote monitoring technology: An exploratory study. *J. Manuf. Technol. Manag.* 27, 154-184. <https://doi.org/10.1108/JMTM-05-2014-0061>
- Hou, J., Neely, A., 2018. Investigating risks of outcome-based service contracts from a provider's perspective. *Int. J. Prod. Res.* 56, 2103-2115. <https://doi.org/10.1080/00207543.2017.1319089>
- Kitchenham, B., 2004. Procedures for Performing Systematic Reviews, Version 1.0. *Empir. Softw. Eng.* 33, 1-26.
- Korkeamäki, L., Kohtamäki, M., 2020. To outcomes and beyond: Discursively managing legitimacy struggles in outcome business models. *Ind. Mark. Manag.* 91, 196-208. <https://doi.org/10.1016/j.indmarman.2020.08.023>
- Korkeamäki, L., Kohtamäki, M., 2019. Ecosystem of outcome-based contracts: A complex of economic outcomes, availability and performance. *Procedia CIRP* 83, 170-175. <https://doi.org/10.1016/j.procir.2019.02.142>
- Liinamaa, J., Viljanen, M., Hurmerinta, A., Ivanova-Gongne, M., Luotola, H., Gustafsson, M., 2016. Performance-based and functional contracting in value-based solution selling. *Ind. Mark. Manag.* 59, 37-49. <https://doi.org/10.1016/j.indmarman.2016.05.032>

Luoma, P., Toppinen, A., Penttinen, E., 2021. Role and Value of Data in Circular Business Models – a Systematic Literature Review. *J. Bus. Models* 9, 44–71 Pages. <https://doi.org/10.5278/JBM.V9I2.3448>

Manresa, A., Prester, J., Bikfalvi, A., 2021. The role of servitization in the capabilities – performance path. *Compet. Rev. Int. Bus. J.* 31, 645–667. <https://doi.org/10.1108/CR-01-2020-0017>

Menon, K., Kärkkäinen, H., Mittal, S., Wuest, T., 2019. Impact of IIoT Based Technologies on Characteristic Features and Related Options of Nonownership Business Models, in: Fortin, C., Rivest, L., Bernard, A., Bouras, A. (Eds.), *Product Lifecycle Management in the Digital Twin Era, IFIP Advances in Information and Communication Technology*. Springer International Publishing, Cham, pp. 302–312. https://doi.org/10.1007/978-3-030-42250-9_29

Möller, H., Shahnavaaz, T., 2020. Use-Oriented Business Model for Consumer Durables: an Exploratory Case Study on Business Model Capabilities.

Ng, I.C.L., Ding, D.X., Yip, N., 2013. Outcome-based contracts as new business model: The role of partnership and value-driven relational assets. *Ind. Mark. Manag.* 42, 730–743. <https://doi.org/10.1016/j.indmarman.2013.05.009>

Ng, I.C.L., Maull, R., Yip, N., 2009. Outcome-based contracts as a driver for systems thinking and service-dominant logic in service science: Evidence from the defence industry. *Eur. Manag. J.* 27, 377–387. <https://doi.org/10.1016/j.emj.2009.05.002>

Ng, I.C.L., Nudurupati, S.S., 2010. Outcome-based service contracts in the defence industry – mitigating the challenges. *J. Serv. Manag.* 21, 656–674. <https://doi.org/10.1108/09564231011079084>

Rapaccini, M., 2015. Pricing strategies of service offerings in manufacturing companies: a literature review and empirical investigation. *Prod. Plan. Control* 26, 1247–1263. <https://doi.org/10.1080/09537287.2015.1033495>

Schaeffers, T., Ruffer, S., Böhm, E., 2021. Outcome-based contracting from the customers' perspective: A means-end chain analytical exploration. *Ind. Mark. Manag.* 93, 466–481. <https://doi.org/10.1016/j.indmarman.2020.06.002>

Sousa-Zomer, T.T., Magalhães, L., Zancul, E., Cauchick-Miguel, P.A., 2018. Exploring the challenges for circular business implementation in manufacturing companies: An empirical investigation of a pay-per-use service provider. *Resour. Conserv. Recycl.* 135, 3–13. <https://doi.org/10.1016/j.resconrec.2017.10.033>

Story, V.M., Raddats, C., Burton, J., Zolkiewski, J., Baines, T., 2017. Capabilities for advanced services: A multi-actor perspective. *Ind. Mark. Manag.* 60, 54–68. <https://doi.org/10.1016/j.indmarman.2016.04.015>

Teece, D.J., 2018. Business models and dynamic capabilities. *Long Range Plann.* 51, 40–49. <https://doi.org/10.1016/j.lrp.2017.06.007>

Tunn, V.S.C., van den Hende, E.A., Bocken, N.M.P., Schoormans, J.P.L., 2020. Digitalised product-service systems: Effects on consumers' attitudes and experiences. *Resour. Conserv. Recycl.* 162, 105045. <https://doi.org/10.1016/j.resconrec.2020.105045>

Visnjic, I., Neely, A., Jovanovic, M., 2018. The path to outcome delivery: Interplay of service market strategy and open business models. *Technovation* 72–73, 46–59. <https://doi.org/10.1016/j.technovation.2018.02.003>

Xu, Y., Ahokangas, P., Reuter, E., 2018. EaaS: Electricity as a Service? *J. Bus. Models* 6, 23.