



This document is the original author manuscript of a paper submitted to an IFIP conference proceedings or other IFIP publication by Springer Nature. As such, there may be some differences in the official published version of the paper. Such differences, if any, are usually due to reformatting during preparation for publication or minor corrections made by the author(s) during final proofreading of the publication manuscript.

Rapid Sales Growth Mechanisms And Profitability For Investment Product Manufacturing SMEs Through Pay-Per-X Business Models

Mikko Uuskoski*, Hannu Kärkkäinen & Karan Menon

Tampere University, Finland,
mikko.uuskoski@tuni.fi*, hannu.karkkainen@tuni.fi &
karan.menon@tuni.fi
*Corresponding Author

Abstract. Manufacturing small and medium enterprises (SMEs) are recognized as a major driving force economically in the European Union (EU). However, manufacturing companies and SMEs have often met with major difficulties in digitalization, and more specifically, in the implementation of novel industrial internet-enabled business models, such as pay-per-X (PPX) type business. The overall aim of this study is to understand how manufacturing companies (especially SMEs) can make use of PPX business models largely in capital product markets, and how this impacts rapid sales growth and profitability for these investment product manufacturers. The studied two investment product manufacturing companies experienced rapid sales growth and there was an impact on the overall profitability for the companies. Sales growth was significant in both companies and PPX business models opened various new opportunities to extend company businesses. We found four main mechanisms that enabled rapid sales growth through PPX business models: strategic, pricing, financing and risk management mechanisms. Both the SME companies also experienced a negative impact on profitability despite rapid sales growth through PPX business models because of issues related to financing the investment product.

Keywords: Industrial internet of things, Industry 4.0, Business Models, Pay-Per-X, IIoT, IoT, Rapid Sales Growth, Profitability

1 Introduction

Manufacturing companies in general, and more specifically, manufacturing small and medium enterprises (SMEs) are recognized as a major driving force in European Union (EU) and elsewhere. However, manufacturing companies and SMEs have often met with major difficulties in digitalization, and more specifically, in the implementation of novel industrial internet-enabled business models, such as pay-per-output type business. It has been noted that manufacturing companies and especially SMEs (that have limited financial, technological and knowledge-related resources, and smaller tolerance towards risks derived from extensive business-related decisions, such as changes

and modifications in business models) struggle with the implementation of novel types of PPU services and related business. For instance, the tire manufacturer, Michelin, after having found that its high product quality and lifecycle cost advantages allowed a new competitive pricing model (pay-per-kilometer), the company reconfigured its sales competences to sell pay-per-kilometer services. However, it struggled for many years to become commercially successful. Michelin's pay-per-kilometer services became first successful, when it was able to implement technological novel possibilities to monitor the tire wear put, and to re-design its pay-per-kilometer services into a specialized PPU solution [1].

Even though in the above example, the company was a very large company, similar problems are common many PPU/PPX business model implementations, and they are common with manufacturing SMEs. While known that existing academic research concentrates almost solely on large companies in the topics of digitalization, Industrial Internet of Things (IIoT) and Industry 4.0 [2], the produced generic research or large-company-related research cannot be used as such by SMEs due to the special characteristics of SMEs [2, 3].

The actual strategic benefits of pay-per-X and especially pay-per-output type business models in manufacturing companies (especially in SME-companies) are very little studied and reported in academic literature. It is not yet properly understood how PPX BMs enable various strategic benefits, such as sales growth, and whether the BMs enable the created new business to be profitable, as well as how the investment product companies implement such advanced business models in such a manner that significant strategic benefits are achieved. Furthermore, it is possible that even if for instance the PPX models would allow sales growth, this sales growth might not be feasible in terms of sufficient profits and profitability. It is not yet properly understood in academic research which types of mechanisms related to the BM implementation help to create such feasible strategic benefits (here, especially sales growth and related profitability).

There are existing recent studies for instance on novel IIoT supported or enabled services and advanced non-ownership business models, including pay-per-use (PPU) and pay-per-performance (pay-per-output/outcome (PPO)) business models (BMs). However, existing studies very rarely consider the specific viewpoint of capital goods manufacturing companies or SMEs, and have provided practically no managerial implications to such companies (e.g. [4]). We aim to address this recognized research gap in this study by studying through detailed case studies manufacturing SMEs which have made use of PPX / PPO business models largely in their business. And in particular, in increasing rapid sales growth and profitability and seem to benefit from such BMs in various ways in investment product manufacturing.

The overall aim of this study is to understand how manufacturing companies (especially SMEs) can make use of PPX BMs largely in capital product markets, and how this impacts rapid sales growth and profitability for these investment product manufacturers. The main research questions are as follows:

1. How is the rapid sales growth achieved by PPX BMs for investment product equipment manufacturing SMEs?

2. How does the rapid sales growth enabled by PPX business models impact overall profitability for investment product equipment manufacturing SMEs?

The studied two investment product manufacturing companies can be considered as at least somewhat pioneering companies in their own investment product businesses, in making use of pay-per-output business models in the SME company category. The structure of this study is as follows: we first review existing research and the research gap in more detail. Second, we introduce the methodology of this paper, describe the cases and explain the questionnaire themes. Third, we present the results, and discuss them, leading finally into the conclusions and managerial implications.

2 Theoretical Background

2.1 Pay-Per-X Business Models

Non-ownership services can be defined as *services in which customers acquire some property rights to an asset and are offered a certain degree of freedom in using this asset for a specified period of time while the burdens of ownership remain with the supplier (owner)* [5]

The advanced nonownership types of business models can be divided into pay-per-use (PPU), pay-per-output and pay-per-outcome (both previous: PPO) models (the jointly so-called PPX business models). Pay-per-use model means that the customer pays for the use of the machine, and usually the other aspects related to the machine, i.e. ownership, installation, maintenance, upgradation, recycling is taken care of by the manufacturer. Pay-per-output models focus on the result of the machine use, which is normally demonstrated in monetary terms, and Pay-per-outcome models on the value derived by the customer after using the machine provided by the manufacturer.

It has been demonstrated in recent literature that advanced PPX business models are significantly enabled and facilitated by Industry 4.0 technologies, and e.g. [6–9] have studied the role of IoT technologies in PPX BMs.

2.2 Business Models And SMEs

Many studies have noted important differences between SMEs and large companies. For instance, [2] provide a good condensed description of major SME characteristics compared to large multinational enterprises: they sum up these characteristics to include 8 overall characteristic groups, including the following: finance, technical resource availability, product specialization, standards, organizational culture, employee participation, alliances and collaboration. Furthermore, various studies, e.g. [1] show that research on Industry 4.0/IoT focuses strongly on large enterprises [16], and only marginally on SMEs [17].

There are studies that focus on servitization and advanced business models in manufacturing, which study the topic of service business and business models from the SME perspective [2, 3], and note the importance of business model studies specifically from SME perspective, due to the above various special characteristics of SMEs. Furthermore, some studies also take at least somewhat into consideration the context of capital goods / investment product sector while studying SMEs [4, 10].

Thus, we can draw the conclusion that business models, including advanced servitization business models such as PPX models, should be studied specifically from the perspective of SMEs for them to be useful, and furthermore, in addition to merely studying SMEs in this context (like some recent studies have done, e.g. [4]), the studies should also provide implications and guidelines for SMEs in particular.

2.3 Servitization, PPX models And Profitability In Manufacturing Companies

In overall, research shows that servitization in general has a positive impact on the performance of manufacturing companies, and furthermore, it increases manufacturing companies' profitability (e.g. [11]). However, while some rather recently popularized services like advanced Pay-per-X type of services may have a positive impact on companies' profitability, it has been noted in literature that there can also be risks in the PPX implementation that require novel capabilities from companies, and may negatively impact profitability unless the implementation is planned carefully (e.g. [12]). Thus, the topic of profitability should be considered when studying the feasibility of advanced BMs, such as PPX models.

2.4 PPX Business Models And Their Strategic Impacts In Manufacturing Companies

There are a few studies which have relatively recently addressed the topic of PPX business model uses in the B2B and partly also in more detail in the investment product sector [4, 13]. They found, in general, first, that in this context, companies have been able to receive important strategic benefits from PPX services. The main focal point of these studies were specifically PPU services, not so much the PPO services and business models, which have been very little studied in the investment product sector companies, and which are focused on in our study. These found benefits were related to three distinct strategic objectives: rapid sales growth, market share expansion, and new market creation. They also found that PPU models accelerated market penetration and impacted rapid sales growth often in the early lifecycle phases of industries, and with relatively novel technologies, such as solar and wind power industries. Also other benefits have been found, including more steady and predictable cash flows, sustainability in terms of both environment and business, etc. [4, 14, 15]

We identified several major mechanisms from recent literature [4, 16] to reflect impacts to the rapid sales growth with PPX BMs in manufacturing companies. Some of the commonly addressed ones were related to sales strategy, pricing, financing, and risk

management mechanisms. Sales strategy impacts sales growth, because customers do not necessarily evaluate lifecycle costs and companies are losing business to competitors, which are less expensive in short term, but more expensive in long term. A well-known basic intrinsic advantage of PPU is that it can be offered to customers who do not desire a large number of uses of the product. Another advantage of the PPU lies in the firm's exibility toward incomplete information about customers' usage needs: if the usage quantities are imperfectly known to the firm beforehand, the seller needs to hedge in its pricing against this uncertainty in usage. One more advantage of the PPU business model stems from the ability to vary the "level of service" by making the product more or less available to the consumers. Varying services affect the customer's benefit but also the service total costs [16].

However, there are also potential risks and downsides noticed from PPX/PPU services: for instance, companies have to cope with the threat that amortizing product costs can take longer through PPU revenues, compared to selling the product directly, and furthermore, the uncertainty about maintenance costs can impact the profitability of PPU services (see [12]).

Thus, we find that there should be more research to better understand the strategic benefits of PPX in the specific context of B2B companies and especially the manufacturing investment product sector companies, also considering the important aspect of profitability of PPX models, and the generic mechanisms behind the strategic benefits and profitability from PPX BMs.

2.5 PPX Business Models And Profitability

There are various existing studies that address PPX pricing and business models in the context of software products. For instance, [17] study the profitability of adopting PPU for a digital good, compared with a fixed-price one-time purchase business model. However, there are limitations in making use of software-related PPX research in manufactured products, especially in the context of investment products and project business/manufacture-to-order products, because of huge differences in production and logistics costs, as well as the related scalability of earnings and the business model to a large quantity of customers. [12] found that regarding PPU profits, uncertainty about a product's maintenance costs can threaten the profitability of PPU services. [16] present a model explaining why PPU business models have become profitable alternatives to traditional selling models across a wide range of goods. In more detail, they identify three situations where a PPU BM can be more profitable than selling: first, when the logistics costs of goods are not too high (new technologies such as Industry 4.0 have been found to reduce logistics costs, making the PPU models more profitable); second, when companies have little information about customer usage profiles, PPU's effective pricing that takes into consideration customers' varying usage offers an advantage over selling; and third, when service providers can vary their service level (in the form of the good's availability), they further increase their advantage because they attract even

the high usage consumers. In such a case, the PPU model performs more profitably even for higher levels of logistics costs.

2.6 Research Gaps Addressed By This Study

In overall, there are very few studies that aim to understand the role of PPX, especially the little studied PPO business models in investment product sector companies, which differ significantly in many respects from the much studied PPX services and BMs in the software sector, as well as the relatively much studied PPX in the consumer mass product sector. The latter ones (PPX in software and mass consumer product industries) differ significantly from investment products in the respect of e.g. the economies of scale that can be made well use of in their PPX business models, as well as considering the very different supplier risk profile compared to the investment/make-to-order products, that this study concentrates on.

We have found no detailed case studies on the mechanisms behind sales growth and profitability in the context of PPX models in SMEs and investment products; we have recognized few more overall multi-company case studies studying PPU BMs (e.g. [4]), which do address PPU business models from the perspective of strategic objectives, but they do not study specifically PPO BM's, like we do in this study, and they do not go into very much detail behind sales growth and profitability mechanisms, and in particular, current studies that exist have not provided implications specifically to SMEs like our study aims to do.

Furthermore, to our best knowledge, our study is also the first or at least among the very first to consider SME company size in somewhat more depth while studying the strategic objectives of PPX business models, and particularly so in understanding the strategic opportunities of PPX BMs in manufacturing SMEs in the specific context of investment product manufacturing companies.

3 Methodology

The aim of this research is to understand how SME companies can make use of PPX business models largely in investment product markets, and how these impact rapid sales growth and profitability for the investment product manufacturers. To study this, we have used case study methodology, by selecting pioneering SME investment product manufacturing companies that have been doing business using the PPX business model for few years. In order to answer the research questions appropriately, we designed a selection criterion, under which we selected companies that were investment product manufacturing SMEs, pioneering in their business, B2B businesses, companies that had already implemented PPX business models.

Based on the above selection criteria, we selected two companies, Company A and Company B based in Europe. Both the companies make complex machines equipped

with Industry 4.0 based technologies. We have signed a confidentiality agreement with the companies, that does not allow us to mention their names and details of their businesses. On a broader level, they are B2B investment product manufacturing SMEs, pioneering in their business and have implemented the PPX business models with many of their customers.

Company A:

Company A manufactures investment products and have been using a variety of PPX business models to sell the investment product to their customers, who in turn use the investment product to manufacture the end-product. Company A has been selling the machines under PPX business models for the last 3 years and approximately 40% of their business comes from PPX business models. Company A works with a third party that buys the machine as assets from Company A and Company A is able to provide the same machine via PPX contract to the end customer. This way Company A offloads the ownership of the asset to the third party. Because of the non-disclosure agreement between the researchers and the Company A, we cannot provide more details about the third party.

The various PPX business models Company A uses are as follows:

1. pay per availability – customer pays for the uptime
2. pay per output (with a minimum payment threshold) – customer pays for the output that the investment product generates. As per the agreement, the customer agrees to pay a minimum per month irrespective of the output.
3. pay per savings (investment part paid partly) – This is a PPX business model which is not implemented but very close towards implementation. The logic of this business model is that the customer pays partly for the product and both the customer and the manufacturer agree to share the savings created by the use of the product.
4. extended warranty – This is more of a “Hybrid” PPX business model. The earning logic behind this business model is of the hybrid nature, as in, the customer pays a reduced price for the investment product and purchases regular maintenance contract where the manufacturer guarantees the performance and any savings made because of the machine’s usage will be shared between the manufacturer and the customer.

Company B:

Company B manufactures investment products and via distributor sells it to the customers (B2B) using PPX business models. The PPX business model contracts are made and controlled by the distributors. Hence, the distributors act as the third party between the manufacturer and the end customer, as far as the PPX business models are concerned. Company B’s distributors have been selling Company B’s machines via PPX contracts for the last 2 years. The distributors are selling Company B’s machines under the pay-per-output PPX business model to the end customer. Company B guarantees the performance of the machine to the distributor in order to make sure the PPX business model contracts are successful. Approximately 15% of their business comes from the above arrangement with the distributor via PPX business models.

We conducted a qualitative interview session with both the companies that lasted for about 2 hours each. In both Company A and Company B we interviewed senior vice presidents, who understood the strategy behind PPX business models for their respective companies in detail. As there is lack of space, we are not able to attach the entire interview questionnaire, but we will describe the major interview themes in the following paragraph. We designed a semi-structured questionnaire with a few open questions and some specific structured questions. All the questions are categorized under the following categories:

1. Background questions
2. Questions about strategic objectives towards PPX business models from rapid sales growth point of view
3. Impact of PPX business models enabled rapid sales growth on the overall profitability
4. SME related opportunities and limitations that impact the rapid sales growth because of PPX business models.

We recorded the interview using a recording device and then transcribed it manually in order to extract the data for the result section.

4 Results And Findings

1. *Rapid sales growth because of the PPX business models*

Both companies stated that the PPX business models are very important for the rapid sales growth. They have grown during last two years significantly because of PPX business models.

Company A stated,

“We started implementation in 2017 and last year (2019) 35-40 % of produced machine are sold via PPX business models.”

Company B stated,

“For us, more than half of the growth, in the last two years is attributed to PPX business models via distributors. We have doubled our turnover during last two years because we are able to sell more machines through the PPX business model contracts.”

2. *Rapid sales growth PPX BMs, mechanisms*

Rapid sales growth has come through different mechanisms. We identified four different mechanisms from interview data: strategic, pricing, financing and risk management mechanisms. According to our results gaining new customers and extending business with existing customers were important for the sales strategy mechanism. Pricing mechanism sets the balance between sales growth and profitability. Partnering with financial institutes is essential to get enough financial resources for growth, and PPU BM is impacted by risks related to sales growth and profitability. Research results showed that financing was experienced as important in PPX BM implementation. Interviewed companies emphasized risk management's important role when implementing PPX BMs.

Table 1. Mechanisms for rapid sales growth by PPX business models.

<i>Factors impacting Rapid Sales Growth</i>	<i>Company A</i>	<i>Company B</i>
Strategic mechanisms	<ul style="list-style-type: none"> - PPX business models allowed selling to new customers, who found the machine very expensive otherwise. - Reason for high price is better technology, which leads to the significant lower operation costs. - Absolute turnover depends on the contract type, where, capital can be in company A's own balance sheet, 3rd party's balance sheet or end customer's balance sheet or all combinations. 	<ul style="list-style-type: none"> - Machines are sold to the distributors who in turn sell it to the end-customer by PPX business models. - Threshold to order reduces. – Reduction in investment cost for the distributors if they buy fleets. - Increase in the maintenance contract to accommodate PPX related issues. - Dynamic business for the end-customer, hence, PPX provides required capacity to them via the distributor.
Pricing mechanisms	High cost of machine limits the sales, but PPX business models allow flexible pricing reducing the customer's threshold for purchase.	Company B reduced the investment cost for the distributors and increased the service contract (to accommodate PPX). This allowed the distributor to sell the machines as PPX contracts.
Financing mechanisms	Usage of third part financing is enabling PPX BM. But it is also limiting and capturing part of the profit.	Current system allows the distributor to extract maximum benefits of PPX contracts.
Risk management mechanisms	For both the companies, their customers can change the machine supplier, because of PPX business models in case of unforeseen circumstances (such as bankruptcy for company A and B)	

Table 1. above describes the mechanisms that enable rapid sales growth by PPX business models. Both the companies have described the mechanisms under the factors of strategy, pricing, financing the product and risk management.

3. *Impact of PPX business models on overall profitability of the companies*

For company A PPX business models related rapid sales growth start impacting the profitability of the company once the cost of manufacturing the machine is amortized. The machine manufactured by Company A is complex and uses novel technologies, which makes it high-end and expensive, resulting into a negative impact on profitability via traditional selling based business model, whereas, PPX contracts guarantee additional profits based on the X (i.e. use, output or outcome of the machine).

Company A stated,

“In short term profitability is not impacted much, but in long term when the fleet is massive and bigger part of the investment is amortized then profits are prominent.”

Company A internally calculated that the investment amortization time is much shorter than expected lifetime of the machine. Moreover, they are also earning during amortization time after paying the financing cost to the third-party company. In company A amortization time is about seven years, but because the product operation cost is very low compared to the competitors, they were able to set a relatively better (and higher) PPX business model contract price. Hence the cumulative profit accrual during the machine lifetime is much higher than if the machine was sold under the traditional selling-based business model.

For company B, the presence of distributors dilutes the additional profits to some extent, but overall profitability is positively impacted because of increased sales (by reducing investment cost) and higher service contracts.

Company B stated,

“As of now we share the profits of PPX business models with the distributor, but it would be ideal if we can keep the ownership of the machines and customers pay using the PPX business models, without the distributor presence”

4. Size (SME) impact to the implementation of PPX BM

Company A saw size of the company (SME) as an advantage in a manner that they can be flexible and fulfil customers specific and customized requirements without much of an internal resistance. PPX business models allow them to approach and sell the machines to bigger customers based on the X (use, output or outcome) even if the cost of the machine is high.

Company B stated,

“Because we are SME, hence there is an advantage from low hierarchy, fast decision making, and capabilities to modify contract according to customers’ requirements (resulting into more deals).”

Both stated that significant disadvantage is that in overall, financing needs of PPX model limit the PPX BM implementation and growth, which also resulted into involving various third parties (financing the machines, distributors).

5 Discussion And Conclusions

We will next draw major conclusions on the basis of our results, and thus aim to answer to our main research questions.

Responding to RQ1 (How is the rapid sales growth achieved by PPX BMs for investment product equipment manufacturing SMEs?). On basis of the results we find that the sales growth of both the studied companies could be significantly impacted because of PPX business models. Investment product manufacturing companies that manufacture high-end machines from the technological perspective (Industry 4.0 technologies) do not usually achieve rapid sales growth through traditional selling-based business model because of a high threshold to buy from the customers. PPX business models

seemed to lower the threshold significantly by allowing the customers to pay for the use, output or the outcome instead of the machine itself. This resulted in rapid sales growth for these kind of manufacturing companies.

We can infer that there were several different types of important mechanisms, described in more detail in Table 1 of section 4 (Results and findings), which enabled or facilitated the rapid sales growth in the studied SMEs. In overall, these mechanisms were related to pricing, financing, risk management and strategic sales decisions as mentioned in Table 1. For larger customer companies, trust (in terms of reliability and performance of the machine) is often a major roadblock while buying expensive high-end machines from SMEs such as company A and company B. PPX business models were found to lower this threshold to buy and to allow the customer to experience the performance as well as the reliability that the machine offers, without a significant risk. Customers were able to get these machines to their respective factories via PPX contracts and pay for the result or performance of the machine. This, in turn, introduced a major risk for the manufacturing companies in terms of capital, while somebody has to bear the cost of manufacturing the machine. Both the case companies were found to have created interesting approaches to mitigate the risks related to capital in PPX model implementation. Company A did this by selling the machines to a third party that provided the needed capital and allowed company A to sell the machine to the end-customer through PPX business models. Company B, in turn, sold the machine to a distributor (also a third-party in this case) and the distributor sold the machines to the end-customers via PPX business models. This eventually led to rapid sales growth for both the companies. PPX business models also lowered the risk for the customers in case of unforeseen circumstances such as bankruptcy of the SME manufacturing companies, which had only a limited capability to carry such risks by themselves, due to their relatively small size and own resources. Customers were able to change the supplier of the machine by terminating the PPX contract and thus, they did not have the burden of a non-performing asset in their company. These mechanisms together led to rapid sales growth for the SME case companies (company A and company B).

Responding to RQ2 (How does the rapid sales growth enabled by PPX business models impact overall profitability for investment product equipment manufacturing SMEs?). We can infer that the studied companies were able to make use of PPX models for rapid sales growth, the PPX models ultimately impacting positively the overall profitability. Results related to the overall profitability clearly demonstrate that because of the different mechanisms for rapid sales growth, the positive impact on profitability was different for both companies. For company A, they saw an immediate impact on their profitability even during the amortization time, after paying of the agreed sum to the third party. More importantly, they estimated that this positive impact on profitability will be grow exponentially once the amortization period is done. For company B, the impact on profitability was also positive but rather limitedly so, because of the distributors. It was essential for them to work towards a situation where they could replace the distributor with a financing third party like company A, and thus start getting a bigger share on profits from PPX business model implementation. In general, rapid

sales growth enabled by PPX business model did impact positively the overall profitability of the companies, but there were other factors, such as third parties, that had their at least temporarily limiting impact to the profitability.

We also found that the small SME size and related limited resources (financial, technological and expertise-related) seemed to impact clearly many of the studied decisions and mechanisms in both the SME companies, which were related to the strategically beneficial and profitable implementation of PPX BMs. SME size advantages such as faster decision making, and flexibility seemed to allow the companies to provide customized solutions to the end-customers making the PPX business model even more attractive for the customers. On the other side, financing the equipment under the PPX business model was a major SME size related downside for both companies. Both the companies dealt with the issue of financing via the third-party mechanism, either engaging with a third party that bought the equipment as an asset and let the company (company A in this case) to figure out the PPX contract terms, or by selling the equipment (and an extensive service contract) as a fleet to the distributor, who in turn sold the equipment to the end-customer via PPX business models. The need for involving such third parties, again, seemed to decrease the profitability of PPX at least in the short term.

Academic contribution. This study contributed to the academic understanding of the major strategic benefits of advanced BMs, especially the very little studied PPX models, through increasing the understanding of the generic mechanisms behind the rapid sales growth in especially in manufacturing companies that produce investment products for the use of other companies in their production processes, which has been studied earlier e.g. in ([4]). We add especially by analyzing in more detail a) some major mechanisms towards sales growth in particular, and b) mechanisms behind the profitability of PPX business model implementation. Some interesting recognized and analyzed ones here are related to the varied use of third parties that provide additional resources (expertise, financing, networks and contacts) to studied SMEs, which cannot find it not feasible to acquire such resources feasibly by themselves.

Furthermore, we add the academic understanding of the strategic benefits realization (especially rapid sales growth and related profitability) of PPX business models, in the context of investment product companies and SMEs in particular. Earlier studies have not provided implications especially to SMEs in this context. We have demonstrated that the SME perspective mattered significantly in studied SMEs e.g. in the manner of the third part involvement, faster decision making as well as flexibility to provide best suited PPX business model contracts to the end customer.

Managerial implications. Managers of the investment product manufacturing SMEs should take into consideration various strategic objectives especially rapid sales growth while implementing PPX models. The cases in this paper have demonstrated various mechanisms that can enable rapid sales growth through PPX business models. It is important that the managers take into account these mechanisms in order to successfully implement PPX BMs, and achieve rapid sales growth through them. One of the key outcomes for strategic objectives is to impact profitability and both the studied cases demonstrate what the managers should take into account while strategizing profitability impacts via rapid sales growth enabled by PPX business models. Managers of SMEs

should think about the role of third parties from the financing perspective in order to achieve rapid sales growth and create an immediate impact on profitability.

Limitations of the study. The conclusions are somewhat limited by this study's approach to studying two case companies, and as such, it does not allow the direct generalization of results to other companies. The results and conclusions are important, however, already in this case study format because there are very few studies that focus on SMEs in the field of advanced BMs (such as PPX business models) and industry 4.0. It seems viable, however, to make the claim that also other SMEs will very probably find both similar types of strategic benefits and related mechanisms viable and useful in their attempts to make use of advanced business models like PPX model.

Future studies can explore in more depth the role of third parties to achieve rapid sales growth and eventually impact profitability through PPX business models, especially for SMEs. This paper presented rapid sales growth mechanisms through PPX business models from SME perspective. Future studies can compare the mechanisms for SMEs and larger companies and identify similarities as well as differences in the mechanisms. One of the objectives of this paper is to study the impact on profitability through rapid sales growth enabled by PPX business models. Future studies can take into account other strategic objectives presented by [4], such as market share expansion and new market creation and study their impact on profitability from investment product SME manufacturing companies. Future studies can focus on pricing of the PPX business model contracts and analyze the impact of pricing on overall profitability.

References

1. Ulaga, W., Estoquie, F., Gebauer, H., Grab, E., März, S., Soler, P., van der Velden, H., Renault, C.: From product to service: navigating the transition. *Insights@ IMD*. 1–4 (2013).
2. Müller, J.M., Buliga, O., Voigt, K.-I.: Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0. *Technological Forecasting and Social Change*. 132, 2–17 (2018). <https://doi.org/10.1016/j.techfore.2017.12.019>.
3. Mittal, S., Khan, M.A., Romero, D., Wuest, T.: A critical review of smart manufacturing & Industry 4.0 maturity models: Implications for small and medium-sized enterprises (SMEs). *Journal of Manufacturing Systems*. 49, 194–214 (2018). <https://doi.org/10.1016/j.jmsy.2018.10.005>.
4. Gebauer, H., Saul, C.J., Haldimann, M., Gustafsson, A.: Organizational capabilities for pay-per-use services in product-oriented companies. *International Journal of Production Economics*. 192, 157–168 (2017). <https://doi.org/10.1016/j.ijpe.2016.12.007>.
5. Wittkowski, K., Moeller, S., Wirtz, J.: Firms' Intentions to Use Nonownership Services. *Journal of Service Research*. 16, 171–185 (2013). <https://doi.org/10.1177/1094670512471997>.
6. Ehret, M., Wirtz, J.: Unlocking value from machines: business models and the industrial internet of things. *Journal of Marketing Management*. 33, 111–130 (2017). <https://doi.org/10.1080/0267257X.2016.1248041>.
7. Ardolino, M., Rapaccini, M., Saccani, N., Gaiardelli, P., Crespi, G., Ruggeri, C.: The role of digital technologies for the service transformation of industrial companies. *International*

- Journal of Production Research. 56, 2116–2132 (2018).
<https://doi.org/10.1080/00207543.2017.1324224>.
8. Metallo, C., Agrifoglio, R., Schiavone, F., Mueller, J.: Understanding business model in the Internet of Things industry. *Technological Forecasting and Social Change*. 136, 298–306 (2018). <https://doi.org/10.1016/j.techfore.2018.01.020>.
 9. Bock, M., Wiener, M.: Nonownership Business Models in the Manufacturing Industry: The Role of Uncertainty and the Industrial Internet of Things. *ICIS 2018 Proceedings*. (2018).
 10. Gebauer, H., Edvardsson, B., Gustafsson, A., Witell, L.: Match or Mismatch: Strategy-Structure Configurations in the Service Business of Manufacturing Companies. *Journal of Service Research*. 13, 198–215 (2010). <https://doi.org/10.1177/1094670509353933>.
 11. Crozet, M., Milet, E.: Should everybody be in services? The effect of servitization on manufacturing firm performance. *Journal of Economics & Management Strategy*. 26, 820–841 (2017). <https://doi.org/10.1111/jems.12211>.
 12. Cusumano, M.A., Kahl, S.J., Suarez, F.F.: Services, industry evolution, and the competitive strategies of product firms. *Strategic Management Journal*. 36, 559–575 (2015). <https://doi.org/10.1002/smj.2235>.
 13. Gebauer, H., Saul, C.J., Haldimann, M., Gustafsson, A.: Organizational capabilities for pay-per-use services in product-oriented companies. *International Journal of Production Economics*. (2015). <https://doi.org/10.1016/j.ijpe.2016.12.007>.
 14. Sundin, E., Lindahl, M., Ijomah, W.: Product design for product/service systems: Design experiences from Swedish industry. *Journal of Manufacturing Technology Management*. 20, 723–753 (2009). <https://doi.org/10.1108/17410380910961073>.
 15. Sundin, E., Bras, B.: Making functional sales environmentally and economically beneficial through product remanufacturing. *Journal of Cleaner Production*. 13, 913–925 (2005). <https://doi.org/10.1016/j.jclepro.2004.04.006>.
 16. Ladas, K., Kavadias, S., Loch, C.H.: Product Selling Versus Pay-Per-Use Services: A Strategic Analysis of Competing Business Models. Available at SSRN 3356458. (2019).
 17. Jiang, B., Chen, P., Mukhopadhyay, T.: Software licensing: Pay-per-use versus perpetual. Available at SSRN 1088570. (2007).