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Revenue models for digital solutions in manufacturing firms

Investigating the interaction between revenue models and
the digital solutions of a Swedish manufacturer

Master's thesis in Management and Economics of Innovation

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Abstract

Manufacturing firms are increasingly expanding their traditional product portfolio to include a larger extent of digital solutions. As these inherently differ from traditional products in the way value is created, new forms of value capture and revenue models are enabled and required. The heavy equipment manufacturer Company V is currently expanding and increasing the emphasis on its digital solutions and therefore needs to find effective ways to charge for them. Thus, the purpose of this study is to research and develop value capturing strategies, in terms of revenue models, and to put those in the context of Company V.

A literature review on digitalization in manufacturing firms and revenue models was combined with a total of 16 interviews with Company V and external experts on the subjects. Three categories of factors that should be considered in the revenue model design were identified in the literature: firm objectives, solution fit, and market factors. These factors were applied in the context of Company V and resulted in a suggested revenue model concept for its digital solutions based on a combination of subscription and tiered pricing, where the price should be scaled per machine.

This thesis argues that charging for digital solutions is necessary to emphasize the value offered and ensure commitment by customers, despite the recommended short-term strategy for Company V to view digital solutions as complementary to the core machine sales. Key implications of this are that Company V should embrace a global approach for the revenue model while utilizing local sales offices for local solution adaptations. This should be supported by continuing to include sensors in machine sales to grow the installed base, reduce the marginal cost of adding customers and increase network effects.

While there is an identified need for a better and clearer definition of what value the digital solutions bring, an increased installed base would in the future improve the offerings with more and better data. It will also be possible to form new offerings based on this, which have the possibility to be leveraged to new types of customers in the ecosystem. This will allow for the digital solution business to transition from complementary to a stand-alone business of Company V, with major growth potential.

Keywords: Digitalization, Digital Solutions, Value Capture, Revenue Models, Manufacturing, Business Model Design

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1

Introduction

In this section the background, purpose, research questions, and delimitations of the thesis are presented.

1.1 Background

Company V, a Swedish company that manufactures mining and infrastructure equipment, is increasing its emphasis on and investment into digital solutions. The company has identified digitalization as a key strategic agenda and recently reorganized its digital solutions into a separate business unit where it is currently investing both through M&A and with internal projects. Despite this increasing focus, the company has not been able to effectively charge for its digital solutions and thus not been able to achieve the business unit's primary goal of revenue growth.

This challenge indicates that the process of pricing, or capturing the value created by digital solutions, has not yet been properly understood. This further creates an issue where the primary goal of the business unit is not achievable since pricing and capturing value is the predecessor of any revenue growth. Thus, a key issue for Company V is the lack of structured ways to capture value by digital solutions. Further, it is also important for any firm to understand not only the implications of these changes to the business model, but also understand how to plan for the future. The time frame for meeting these business challenges is within the next 1-3 years, putting an emphasis on the near-future. This requires the revenue model to primarily fit with Company V's current or near-future products, market situations, and customers of Company V.

Company V currently offers two types of software: traditional planning software essential for machine operation, and software delivering complementary digital solutions. The planning software provides the ability to plan and design the use of the equipment and it uses basic data from the machines to track the basic progress of the operation. This software is maintained by the capital divisions in Company V that manufacture the machines and not by the digital business unit due to the fact that the planning software is considered a standard and basic part of the equipment sold. The machines are also able to provide large amounts of data from sensors regarding the equipment itself and how it is used, often described as telematics. This is the foundation of the other type of software, the digital solutions, and has had an increased focus in many industries the latest years, but the heavy original equipment manufacturer (OEM) industry is lagging behind. The data depends on sensors being installed on the machine, but also wireless technologies on the machine and in the worksite, to allow for near real-time communication and logging.

As mentioned, Company V has recently reorganized, moving the digital solutions

to a separate business unit within the product company. This separation has not affected the sales organization which through separate, local, sales companies sells both machinery and digital solutions currently. The digital solutions based on this can be classified as complementary to the equipment, as they will not substitute the need for equipment but instead increase the value of the equipment that is sold.

Currently, the digital business unit's portfolio is mainly consisting of different types of solutions offered to the customers including raw data, a web portal, APIs, and customized dashboards. These solutions have been offered without a structured approach, and have generally been offered for free by Company V. These digital solutions give the customer access to sensor data from the equipment in different ways including usage and wear metrics such as engine hours, fuel consumption, and drill meters. This data gives the customers the opportunity to understand their equipment fleets and how they are used, make improvements, and become more productive. Thus, these digital solutions offer more value on top of the operation of the machine through the sensor data. Improved analytics to further help customers understand their operation are in development by Company V.

The digital solutions thus enable new ways to create and capture value. Value capture can be described as one of the two key components of a business model, where the other is value creation. The value creation by digital solutions from Company V is claimed to be better understood by the company compared to the value capture process. However, the concepts are sometimes interlinked where some value capture tools support further creation of value. An example of this is improved customer relationships where knowledge about the customers' operations allows for new and better product development. In addition, since the digital solutions of a manufacturing firm such as Company V will contain usage data from other products, the work of capturing value by the digital business will help the creation of value in other parts of the firm. This could be seen as a potential for internal value to be captured as well.

Value capture is a multi-staged process that includes more concepts than just how to price. Looking at the business situation of Company V and aspects of the digital solutions gives a basic understanding of who the customers are. Since the digital solutions are based on the telematics of heavy industry machinery, including current customers of Company V, these are the likely initial customers of these digital solutions. It might be tempting to immediately think about pricing, but pricing is linked to the key concepts of how to charge, and how to sell. These two concepts are heavily interlinked, and in this thesis both are discussed under the definition *revenue models*. Understanding the revenue model is a clear success factor in any pricing endeavor, and therefore this is the focus of this thesis.

1.2 Purpose and Research Questions

The purpose of this study is to research and develop value capturing strategies, in terms of revenue models, for the digital solutions offered by Company V. Further,

the study aims to present current implications to consider related to these revenue models and finally to address future possibilities. To specify, the purpose of this study is to answer the following research questions:

- Which revenue models are relevant for the digital solutions currently offered by Company V, and why?
- What are key considerations and implications for Company V to leverage those revenue models, with regards to its current position?
- What are future possibilities for Company V in digital solutions and revenue models?

1.3 Delimitations

Some delimitations are placed on the study to increase the quality of the recommendations on the specific issue presented. The scope includes an investigation on how to effectively capture the value created by the digital solutions offered to the customers of Company V, not other parts of the digitalization of the customer process. This means that the potential value of digital solutions aimed at making the communication and sales process with the customer digitalized are not included in the scope, e.g. digital invoicing systems. Further, how internal value should be captured is also outside the scope of this thesis, e.g. how to split the revenue internally across business units inside the product company. The focus of the thesis is instead on the revenue models toward the customer and how to effectively appropriate that value.

In other words, it is the value created by information from the used equipment of Company V and value created by software using that information that is in focus. The scope further excludes what was in the section 1.1 described as planning software since it is being sold exclusively together with the machines in a fixed revenue model. Additionally, the sales channel for this software is logical since the planning software, and the basic data associated with it, is necessary for the machine to operate and thus considered a part of the core machine rather than a separate digital solution.

Further, since the purpose of the study is to be used as a basis for forming the value capturing process, the recommendations provide insights regarding what revenue models are suitable for the digital solutions investigated. Thus, the quantitative part of revenue and pricing, i.e. how to decide the actual price level, is not discussed as a part of this study.

Additionally, the report approaches the market situation in a static way in accordance with the current state, not taking into regards the competition's reactions to potential actions of Company V. This is to further keep the study focused and to provide Company V with insights in what can be done in the current state.

Finally, due to confidentiality requirements of products in development the study

1. Introduction

is based around concepts of what digital solutions could possibly offer, not what Company V specifically will offer in the future.

2

Literature

In this chapter the literature regarding the digital context, revenue models, and how to manage revenue models is presented to create a foundation for the discussion based on what is already known within the subjects.

2.1 Digital Context

In this section more in-depth background on digitalization in manufacturing firms as well as digital solutions is presented, based on existing digitalization and servitization literature, to give further context for the coming discussion. In the first part, the situation and challenges of digitalization for manufacturing firms are described. In the second part, some central characteristics of digital solutions compared to traditional products are presented.

2.1.1 Digitalization in Manufacturing Firms

There is an ongoing shift in manufacturing firms, from just offering products to also including services tailored to the product or the customer (Lerch & Gotsch, 2015). Cusumano et al. (2015) argue that these types of services can be either of complementary or substituting character for product firms. Complementary services support traditional product sales and can do this in different ways. They can be smoothing in that they make the purchase or use of the product easier for the customer, or they could be of a more adapting character and add features to the product to improve it in new ways (Cusumano et al., 2015). Substituting services on the other hand replace the actual purchase from the customer, but not necessarily the product or value delivered. One example of this that Cusumano et al. (2015) present is selling a service that is offering run-time on engines charged by the hour instead of selling machines.

This servitization has coincided with a rise in digitalization, where some of the services are enabled by or offered through digital solutions. Further, digitalization has shown effects in providing manufacturing firms with more efficient operations and processes, as well as opening up for improved products (Björkdahl, 2020). Lerch and Gotsch (2015) argue that firms can not ignore the changes of the industrial landscape and need to embrace these services and digital solutions to stay relevant.

According to Gebauer et al. (2020), equipment manufacturers increasingly invest in digital technologies to develop their offerings with improved customer efficiency and effectiveness. However, some industries, such as the mining industry, are notably mature with a low rate of innovation (Bartos, 2007). For suppliers in that industry, such as those delivering heavy machinery, this could result in a slower or delayed adoption of innovations compared to other manufacturing industries.

While the general interest and thus investments in digitalization are proven to be large, manufacturing firms are struggling to improve the financial performance from it (Gebauer et al., 2020). This is commonly referred to as *the revenue paradox*, i.e. investing in digitalization but not experiencing sufficient revenue from it (Gebauer et al., 2020; Kohtamäki et al., 2020). Kohtamäki et al. (2020) further emphasize this by addressing that manufacturing firms collect large amounts of data from their customers without the capabilities to utilize and capitalize on it, thus lacking a clear strategy to effectively realize the business opportunity. Björkdahl (2020) argues that the focus of business leaders should be on value creation and capture of digitalization through new capabilities and strategies, rather than on further advancement of the technologies themselves. Building on this, Kohtamäki et al. (2020) also argue that digitalization in itself is not always enough, but an efficient configuration of servitization capabilities is required to leverage the benefits from it. Ambroise et al. (2018) further highlight this by arguing that to fully capture the improvements of the firm's financial performance from new services, the right configuration is central. If this is not done, manufacturing firms risk missing profitable opportunities and losing to competition.

Gebauer et al. (2020) identified multiple barriers hindering equipment manufacturers from successful digitalization, including failure to progress with the business logic change, not overcoming management cognition challenges, and an inability to develop consistent new business models for it. The latter implies the challenge of developing consistency between the value proposition, value creation, and the profit equation.

Additionally, the servitization literature offers more perspective on the challenges of digitalization for manufacturing firms. Coreynen et al. (2017) bring up three levels of barriers for firms increasing their servitization portfolio with the help of digitalization. The first level of barriers encountered includes resistance within the firm, skepticism towards the potential of the solutions among the personnel, and customers having the attitude that the new services should be provided for free. At the second level, challenges such as the customers being used to acquiring products rather than paying for performance must be met. At the third and final level, barriers including problems with fitting the new business model with the manufacturing firm's original business model are identified. Coreynen et al. (2017) then argue that leveraging information and communication technologies as well as dynamic resources and capabilities of the firm can help with dealing with these barriers.

All of this points to new opportunities for firms that historically have been manufacturing products to help customers gain more value as long as the outlined challenges are effectively met. These opportunities also open up for new ways to price and charge, but this area is still developing (Füllemann & Salmerón, 2016). While there could be many different objectives, one that is stated to be shared by every firm is to minimize unprofitable agreements while not reducing the overall business, and Füllemann and Salmerón (2016) argue that the solution to this is the ability to leverage new pricing capabilities.

Digitalization and digital solutions have been framed and described in multiple ways in the literature. Most definitions center around the increased use of, sometimes new types of, data to develop new services targeting efficiency as well as improving existing services and thus deliver more value to the customers (Björkdahl, 2020; Gebauer et al., 2020; Kohtamäki et al., 2020). As Gebauer et al. (2020) described, equipment manufacturers invest in additions to their products including sensors, actuators and software to enable the collection of data and also to add connectivity to the equipment. This data, combined with analytics and visualizations, support improved decision making, increased internal effectiveness as well as remote monitoring and control of the products (Kohtamäki et al., 2020). Thus, digital solutions can be defined as leveraging data and connectivity to improve the existing business while also providing possibilities to develop new valuable offerings. However, Björkdahl (2020) highlights the importance of ensuring that the digital business has sufficient overlap with the core for manufacturing firms investing in digitalization.

2.1.2 Digital Solutions

Digital solutions differ from traditional hardware offerings in multiple ways. Firstly, in comparison to traditional products where the value can be considered quite tangible, digital solutions are characterized as experience goods (Ploner et al., 2020), i.e. goods where the value is difficult to understand and interpret without experiencing it first. Due to this, customers often need to be able to use or try experience goods before it is possible for them to determine their value and thus what they are willing to pay for it (Dhebar, 2016; Ploner et al., 2020).

Further, the cost structure of offering digital solutions is different compared to the costs of traditional hardware manufacturing (Grunenwald & Vernon, 1988). Digital solutions often have high development costs when they are produced, while the costs of reproducing the offering once it is developed often are considered low, according to Ploner et al. (2020). Kjellgren and Liif (2011) state that the majority of the costs related to digital solutions consist of development and maintenance activities and that reproducing another unit of software has a cost close to zero due to this.

Additionally, Harmon et al. (2009) argue that information technology enables more information to flow between the customer and the vendor. This information can increase the customer-vendor interaction, e.g. enabled by swift communication over the internet. Iveroth et al. (2013) also argue that digital solutions can enable information to be accessed by the vendor in a new way that can guide pricing decisions. Other aspects of the increased information, which are brought up by Harmon et al. (2009) and Iveroth et al. (2013), include an enhanced reach of the vendor to the market through the ability of the customers to access the solutions over the internet. Further, information technology offers new abilities to tailor both the solutions and charging process of the customer by what is achieved with the product. Two examples of new ways of charging given by Füllemann and Salmerón (2016) are per miles rolled or tonnes of material excavated.

The software market is also characterized by network effects, as argued by Gal-

laugher and Wang (2002) and Lehmann and Buxmann (2009). These network effects can take multiple forms, e.g. working directly or indirectly, but are generally described as increasing the value of the offering when the installed base grows and more users adopt the solution. The network effect is a feature that separates the software industry from conventional ones (Gallaugher & Wang, 2002). This can lead to lock-in effects and, through that, new perspectives and opportunities when it comes to pricing (Lehmann & Buxmann, 2009).

Füllemann and Salmerón (2016) highlight the often occurring impossibility of directly charging more for a digital version of an existing product, but they also note that a package of new digital solutions can offer new pricing opportunities. Further, it is possible for vendors to change the relationship with customers and become an essential part of their operations. Examples of this are product companies offering platforms and cloud solutions to provide insights into the customers' operations, an area likely to grow significantly in the future (Füllemann & Salmerón, 2016).

2.2 Revenue Models

In their study, DaSilva and Trkman (2014) find that choosing the right business model is essential for managers looking to outperform their competition. Further, the authors also define several key components of a business model, including the revenue model. A revenue model is defined by DaSilva and Trkman (2014) as how a business is appropriating its revenue. Referring back to the context of digital solutions, Björkdahl (2020) states that digitalization should be aligned with the overall business strategy, and that the right business model is a key part of any business strategy.

As presented in section 1.1, the term revenue model is in this thesis defined as the two interlinked concepts of how to sell and how to charge. DaSilva and Trkman (2014) give a perspective of the concept using Ryanair. They define the revenue model of Ryanair as not only including the low fairs, but also the miscellaneous charges and ancillary revenues. Put briefly, the revenue model is an important component of the business model and includes more than just the pricing (DaSilva & Trkman, 2014).

There are multiple ways to employ revenue models with digital solutions, and different literature highlight different aspects of it. Lehmann and Buxmann (2009) describe the option of either charging through a single payment or through recurring payments. Mohammed (2005) argue that firms can either seek to set one optimal price or go with a multi-price approach where the alternatives are supposed to better match the different characteristics of the market. Further, Iveroth et al. (2013) bring up the option of whether to charge for future outcomes, like the output from the sold solution, or charging immediately, i.e. for the sold product, as another potential way to configure the revenue model.

When configuring revenue models, the context of the industry is relevant to keep in mind. As brought up earlier, there are heavy investments into digital solutions,

but some industries might still be slow-moving (Bartos, 2007; Gebauer et al., 2020). These investments can be excellent opportunities to employ new revenue models that better fit the digital offer, or as M. W. Johnson et al. (2008) put it, the new digital solutions can require new business models and thus, in turn, new revenue models.

To approach the revenue model subject, the different factors and options found in the literature are synthesized where the revenue models Up-front Payment, Subscription, Tiered Pricing, Bundling, Razor and Blades, Freemium, Trial, and Pay-Per-Use are in focus. An overview of the findings from the literature on each respective model can be seen in Table 2.1.

Table 2.1: Key aspects of the revenue models in focus

	Suitable for	Advantages	Disadvantages	Important considerations
Up-front	Firms with main objective to cover costs.	Customer can predict what they pay. Vendor guaranteed income regardless usage levels. A convenient and simple transaction for both parts.	High CapEx. Big investments leading to complex decision-making processes.	Difficult to customize the price levels to individual customers.
Subscription	Services where access can easily be granted and dis granted. Customers not wanting large up-front costs.	Customers get flexibility and low CapEx. Customers become more willing to experiment with the solution through a more active relationship with the vendor. Vendor able to capture larger lifetime value.	Less predictable revenue streams for the vendor. Risk of losing customers if not continuously proving the value.	More important to deliver and communicate the value to the customers continuously making e.g. back-ups important.
Tiered Pricing	Customer segments having varying levels of demand.	Possible to target multiple WTP levels simultaneously. Ensuring cost coverage and high profits. Supporting a higher level of customer understanding.	Might attract high paying customers to the cheaper packages, cannibalizing on the profits.	Need to identify the features of the offering to base the different tiers on.
Bundling	Having a core product and some peripheral products that also add value.	Customers pay more for the whole package but still appreciate it. Increased lock-in effects and switching costs. Creating a more elastic demand. Can extend competitive positions over markets.	Industry players within manufacturing might tend to like to make individual purchases.	Need to make intelligent bundles that match the market.

table continued on the next page

2. Literature

Razor and Blades	Experience goods. Products with potential lock-in effects of complementaries.	The vendor gets recurring revenue. Can help the complementary product to grow after its launch. Easier for the customer to try the product. Capturing customers with lower willingness to pay, increasing the installed base while still making up for the investments.	More time needed to cover investments.	Customer should be locked-in. Competitors should be locked-out.
Freemium	Experience goods with network effects present. Able to divide offer to free & paid tiers with incentives to upgrade.	Can grow the installed base for network effects. Will allow customers test experience goods before committing.	Potentially poor B2B fit. Risk for the vendor of not getting revenue.	Negligible marginal costs needed. Finding balance between free version and premium version. Creating incentives to upgrade.
Trial	Experience goods. Network effects to a lesser degree. Low marginal cost to add new free customer.	Will allow customers to test experience goods before committing.	Lower lifetime value of customer recruited with trial. Delays the relationship between customer and vendor, causing less understanding of the offer.	Need to recruit more customers to offset lower lifetime value per customer. Reduces willingness to pay.
Pay-Per-Use	Well defined and measurable value creating usage by the customer, with close relationship, and where usage levels are relatively stable.	Very high emphasis on customer value. Turns fixed costs to variable costs for customers. Increases flexibility for customers. Lower entry barriers. Gives information about usage back to vendor.	Less predictable revenue. More time needed to cover investments.	Need to be able to measure usage, have it well defined. The usage should be the value adding activity enabled by the solution.

In practice, there are variations, hybrid models, and combinations of multiple of these revenue models. But for simplicity, the revenue models are presented individually in the following subsections to showcase and contrast their main characteristics.

2.2.1 Up-front Payment

The up-front model is, according to Harmon et al. (2005), defined as the customer paying a fixed price for unlimited use of the solution. The customer is thus given

the right to use the product as it is at the contract time forever, and it does not traditionally include any future updates or enhancements of the solution (Iveroth et al., 2013). Due to its characteristics, up-front payment is usually considered a cost-focused revenue model where the primary objective is for the selling firm to recover imposed costs (Harmon et al., 2009). Lehmann and Buxmann (2009) describes this up-front payment model as one that is traditionally used for software licenses. Further, Chao et al. (2017) argue that customers shift preferences toward operating expenditure (OpEx) over capital expenditure (CapEx) which implies them wanting discounts on the up-front cost when purchasing technology, putting a lot of pressure on this traditional model.

For the customers, a potential advantage of the up-front payment model is that their payments become visible and predictable to a higher degree (Harmon et al., 2005). Ojala (2012) argues that, due to its fixed nature up-front payment is beneficial for customers that intend on using the solution over a long time period and with high frequency. Additionally, up-front payment is argued to be a simple and convenient way for the customer to procure software since it only needs to get the solution once, and after that it will remain constant (Jiang et al., 2007). Other practical benefits for the customer include being able to store data internally in a secure way, since it will own the license locally without any potential external access of the vendor (Ojala, 2012). This also reduces the dependency on internet connectivity.

The challenge of implementing an up-front payment model is to match the price with the customers' willingness to pay (WTP), where it might be a drawback to not have the flexibility of being able to customize the price for each customer e.g. on the basis of usage level. Harmon et al. (2005) highlight the importance of effective customer segmentation in these situations. Purchasing digital solutions through an up-front payment model is usually considered a big investment for firms, meaning the customers' procurement and decision-making process can turn out extensive and time-consuming if comparing with other revenue models (Ojala, 2012).

With up-front payment the selling firm is guaranteed the income regardless of the usage or satisfaction levels of the customer, which can be beneficial according to Iveroth et al. (2013). The usually high up-front license fees help the vendor cover the development costs in a faster way than the other models (Ojala, 2012). Another observed benefit of the up-front payment model is that it can create customer lock-in if the solution sold allows it (Ojala, 2012), making the customers more loyal. However, Iveroth et al. (2013) at the same time highlight the disadvantage that potentially high satisfaction and usage rates, if achieved, are not rewarded with increasing revenue over time for the selling firm. Thus, gained loyalty might not yield additional revenue to the vendor through the up-front payment model.

2.2.2 Subscription

Subscription is a model where the customer pays a fixed fee in recurring time intervals for access to the product or service, e.g. on a weekly, monthly, or yearly basis (Ploner et al., 2020). The conditions are often determined in terms of length and

frequency of the payments, i.e. how often payments should be made and for how long time the subscription should run (Lehmann & Buxmann, 2009). Therefore, as opposed to purchasing a product, a subscription can be seen as a model where the customers pay for the right to use a product rather than owning it, as argued by Iveroth et al. (2013).

More than just the access and right to use, upgrades and enhancements of the product made after the time of the contract can be, and are often, included in the subscription (Iveroth et al., 2013). Ferrante (2006) argues that the subscription model for software solutions is built on the premise that both parts benefit from these continuous updates. Customers are also argued to be being more willing to experiment with the solution when it is procured through a subscription model (Chao et al., 2017). This experimentation opens up an opportunity for more customer feedback to be collected by the vendor, which can use it to improve the solution and thus its overall position. Related to this, Turunen (2012) argues that software updates are faster and more effectively carried out for solutions with a subscription model, since no new buying process is needed.

The subscription model offers the benefit of a steady revenue stream for the vendor, while the customer gets to disperse its payments over a longer time (Ferrante, 2006). It is argued that customers value the flexibility that comes with the absence of high up-front costs in the subscription model and Chao et al. (2017) discuss that due to the structure of the model, subscription payments makes the costs better reflect the businesses of the customers compared to up-front payments. This can enable reaching out to new customer segments who otherwise would not be able to handle a large up-front payment. For existing customers, Chao et al. (2017) proclaim that additional lifetime value can be captured by charging through a subscription model.

Additionally, Turunen (2012) argues that subscription models for Software-as-a-Service (SaaS) solutions have a lower total cost of ownership for the customers since there are no costs hidden for the customer. The same advantages for the customers can be gained unrelated to SaaS arrangements when the vendor offers a subscription where all maintenance and up-time is included. Hence, the subscription model is argued to have traits that customers benefit from.

Digital offerings where access to the solution easily can be granted or removed make it possible to swiftly deploy a subscription model (Ploner et al., 2020). This means that even for short payment periods, a subscription can be started and ended. For traditional offerings, such as hardware, it is considered less convenient since a sign-off would imply having to collect the physical product to withdraw the access when the subscription is to be ended.

When customers pay for their solutions through a subscription model, they are becoming more aware of what they are paying for (Chao et al., 2017), and they are given the option to stop the subscription if not satisfied with the solution, depending on the contract length and terms. Turunen (2012) highlights that if the solution offered through subscription is not working well it will create a bad reputation and

lead to the vendor losing customers. However, if the value can be proven, customers are expected to stay loyal to the subscription and this churn will be low (Chao et al., 2017). It is therefore crucial that the value is continuously communicated and delivered when using a subscription model, as highlighted by Turunen (2012). The solution must thus have the possibility to deliver continuous value, not only bring value right after the transaction. Hence, a subscription model can be argued to put additional requirements on the vendor to continuously deliver sufficient value, as it directly impacts whether they will continue to get revenue from customers.

While providing clear financial benefits for the customer the subscription model might come with larger risks for the provider (Turunen, 2012) if availability, spare parts or back-ups are required to ensure constant access. Turunen (2012) argues that this risk is especially high for digital services which rely on internet connectivity. Therefore, in addition to delaying the payback of development costs due to a shift to revenue over time, there is an additional risk of lost revenue due to service outages. However, to protect revenue and minimize the risks related to the implementation of a pure subscription model, a combination of an up-front cost and recurring subscription costs can be leveraged through a hybrid model, as argued by Chao et al. (2017).

2.2.3 Tiered Pricing

The tiered pricing model, sometimes in literature also referred to as versioning, is when a product is sold in different combinations of quality, features, and price, as defined by Ploner et al. (2020). This revenue model requires that the offering can be divided into different tiers in ways that can be offered to the customers (Mohammed, 2005). The different tiers can be divided in several ways, where Mohammed (2005) presents the options of taking a good/better/best approach or a horizontal versioning, such as product groups, approach among others.

Tiered pricing is considered a cost focused revenue model with the primary objective to achieve cost coverage as well as high margins through targeting the differences across customer segments and their differing levels of WTP (Harmon et al., 2009). But it can also be viewed as a somewhat value focused approach, since it is based on trying to understand and identify what attributes the customers value and then forming the tiers after that, as Harmon et al. (2005) argue.

To succeed with tiered pricing the attributes that have different levels of value for different customers, e.g. delivery time options, product quality, service levels, etc, need to be identified (Ploner et al., 2020). If the tiers are based on the appropriate attributes of the offering, the WTP across the customers can be efficiently leveraged. Thus, some level of understanding of the customers' perception of the value is essential, as well as an offering that is suitable to split into tiers.

Harmon et al. (2005) gives two examples to showcase the tiered model. IBM based its software pricing on the level of power the customers' system had, where more powerful systems were argued to yield more value from the software which in turn

motivated a higher price for those customers. However, this tiered approach created tension between IBM and its customers, which showcases that using the tiered pricing model it is important that the customer itself can see the increase in value across the different tiers (Harmon et al., 2005). Adobe also implemented tiered pricing but by requesting different price levels for Acrobat depending on how the users aimed to use it, e.g. based on the possibility to sign PDFs or not. This was by Harmon et al. (2005) argued to be an example of a more favorable approach of tiered pricing where the connection to value was perceived and communicated more clearly.

The primary challenge with the tiered model is that the cheap tiers risk cannibalizing on the more expensive ones, according to Mohammed (2005). This becomes a problem if the cheap tiers are not sufficiently profitable. However, Mohammed (2005) argues that the configuration of the tiers should be designed so that no tier is unprofitable and thereby avoid this cannibalization risk to a large extent.

2.2.4 Bundling

The bundling model is based on the packaging of different products and services and selling them as a unit. According to Iveroth et al. (2013), the aim is to create bundles that consist of a core product and additional peripheral products. The core product should be a product that customers value on its own outside of the bundle. The peripheral products should be products that the customers might not value on their own, but appreciate or that increase the perceived value of the core product (Iveroth et al., 2013). The objective is to get customers to pay more for the total purchase, as more things are included and the price can be set higher, than they would solely for the core product. This should be accomplished while still giving the customers a higher value and appreciation of the whole bundle, as argued by Iveroth et al. (2013).

It should be noted that the bundling model does not enforce that all products in the bundle are covered at the same price, or in the same revenue model such as upfront payment. Examples of this are the bundling of a cell phone with a 24-month subscription to the service, or as Bar-Gill (2006) describes, the bundling of a printer with the ink cartridges purchased as refills during the lifespan of the printer.

Ploner et al. (2020) argue further that the main advantage with bundling for the vendor is a more elastic demand. The authors mean that bundling reduces the differences across customers when it comes to their price sensitivity since, generally, customers are less specific with their WTP for bundles compared to individual purchases. Therefore through bundling, a firm can maximize the total sales within a product line and both the production and use will thereby achieve economies of scope (Iveroth et al., 2013). Further, Chung et al. (2013) also present purposes of bundling related to competitive positioning, where an effective bundling strategy can help extending a monopoly across an additional market as well as it can deter competitors from entering the firm's market.

A bundling model can be structured with multiple configurations spanning from

pure bundled, mixed bundling, to unbundled setups. According to Olderog and Skiera (2000), a vendor that is offering the products only in bundles is using a pure bundling strategy and a vendor that is solely offering products individually is using an unbundled model. A mixed bundling model is applied when products and services are offered both in bundles and individually at the same time. Further, Chung et al. (2013) argue that bundles can constitute both independent products and services as well as complementary products and services that are related to each other.

Kjellgren and Liif (2011) argue that the bundling model is of high relevance within software sales, where a common structure of the bundles include the software as the core product that is bundled with peripheral products such as service and maintenance. Therefore, bundling can be considered appropriate for digital solutions. However, Ploner et al. (2020) argue that manufacturing firms might have an inherent preference towards buying individual products. In that case, the authors recommend a focus on forming an intelligent bundling strategy where a clear understanding of the market and customers are required to ensure that the benefits of the bundling model are able to be captured.

Purchasing a bundled offer can be advantageous for the customer since the sum of buying the bundle often is cheaper than buying all parts individually, according to Kjellgren and Liif (2011), and it will ensure that all parts purchased fit together. Therefore, if all parts of the bundle are valuable for the customer it can be an economically beneficial model for both parts. However, bundling can impose switching costs for the customer (Kjellgren & Liif, 2011) as the customer automatically gets a larger share of the system from one vendor which makes it harder to change the vendor. At the same time, higher switching costs and thus a customer lock-in, might be perceived as a benefit for the vendor, as long as it does not make the customers hesitant to purchase the bundle as a result.

2.2.5 Razor and Blades

The razor and blades model is named after the classic example of the revenue model in use - razor handles and the complementary razor blades. The model consists of a vendor offering a durable razor handle at a low price, possibly even at a loss (Dhebar, 2016). To earn money on this transaction the same vendor offers razor blades that fit the handle, and that need to be repurchased during the lifespan of the handle, at a significantly higher margin. Hence, the vendor offers a product at a low price that requires a complementary product to function, while charging a higher margin for the complementary product that has a shorter lifespan. For physical products this could be described as generating the profits from the refills of the core product, but for digital products these refills might not be as simple to grasp (Zawada & Savitz, 2012). The razor and blades model will thereby provide the vendor with recurring revenue streams from the complementary products, which could be considered one main benefit and objective with this model. The retailer Amazon has used a mix of physical and digital products to enable such a revenue model for its line of Kindle tablets (M. Johnson & Lafley, 2010; Zawada & Savitz, 2012). By selling millions of tablets at a loss Amazon has created a marketplace for digital goods and services

and thereby managed to cover the initial loss (Zawada & Savitz, 2012).

The razor and blades model can be used with different strategic intents, e.g. to establish a strong launching board for the complementary product's business or winning platform standard wars (Dhebar, 2016). Further, the pricing structure of offering a low initial price unlocks customer incentive through several different aspects. It allows the customer to more easily try the product, alleviating the hurdles associated with a new product category or experience goods in general, where a low initial price will help the customer to experience the full value of the product and its complementaries (Dhebar, 2016). Dhebar (2016) further notes that customers might focus on the initial expenditure instead of the rational evaluation of the lifetime cost, potentially due to a limited initial budget, which allows the lower initial price to become an incentive. If the vendor is facing competitors that are using revenue models that require higher initial investment by the customer, the razor and blades model could create a small lock-in effect for customers invested in the product. If the higher cost of the complementary product is still lower than the competitors' initial investment of core product and complementaries, the customer invested into the vendor's product will have a reduced incentive to switch to a competitor.

Dhebar (2016) presents other lock-in mechanisms related to the razor and blades model, including the customer's emotions, contracts or using a propitiatory interface. Such lock-in effects are essential for the razor and blades model to work. In the example of Amazon and the Kindle tablets, the lock-in effect came from a combination of making it easy for customers to purchase through the Amazon store while Amazon simultaneously made it difficult for competitors to launch competing stores that would be accessible from the tablet (Zawada & Savitz, 2012).

The revenue and profit from the complementary goods are dependent on customers continuing to use the product and purchasing the complementary product from the vendor and not a competitor (Dhebar, 2016). Thus, the products must match the concepts of the model with a lock-in and prevent competitors from supplying the complementary product. Dhebar (2016) builds on this to note that a basic requirement to use this revenue model is that the product can be offered as a base product with complementary products sold after the initial sale. The lack of either a complementary product to sell or the lack of a lock-in to force customers to purchase the complement will block any vendor's ability to sustain a razor and blades model. However, even if these concepts are in place, the vendor offering the model must also be able to sustain the financial costs of subsidizing the initial sale to gain the rewards from complementary sales at a later date (Dhebar, 2016).

This revenue model is also possible to reverse, called the reversed razor and blades model. An example of this is Apple with the iPod and the music store iTunes (Mullins & Komisar, 2010). Apple used the cheap, convenient and broad catalog of songs on iTunes as the complementary good to increase its sales of the expensive handle, the iPod. Further, Apple knew that its complementary good would generate value since artists, labels and customers were all getting increased value with iTunes (Mullins & Komisar, 2010). This follows the notion of having the complementary

goods connected with the value created by the product.

The reversal of the model is only applied to the pricing or margin part of the model, with the handle being the expensive part (M. Johnson & Lafley, 2010). However, the concept of customers purchasing the handle before the blades is kept intact which allows for the model to still be viewed as a razor and blades model, just with reversed margins. In the light of the importance of lock-in, as discussed above by Dhebar (2016) and Zawada and Savitz (2012), Apple also featured lock-in for its reversal of the revenue model. Early iPods supported other music stores than iTunes, and all iPods allow for other songs to be added to the devices. iTunes, however, only supported the iPod and no other mp3-player offered by competitors. Thus the lock-in effect is applied to the complementary product instead of the handle, the opposite compared to the regular model. This demonstrates that in both versions the lock-in needs to ensure that the value created by the low cost part, either the handle or the complement, is directly linked to more revenue of the higher margin part of the product. Thus, the reverse razor and blades model keeps the order of the purchase but changes the margin configuration on the products, with the lock-in also changed to follow the reversed margins.

2.2.6 Freemium

The freemium revenue model consists of one more basic set of offerings provided free of charge and a complementary setup offered at a premium price, according to Pujol (2010). The author describes it as the customers of the free offering are paying with mind share instead of money. The aim of the free users is to develop an awareness of the solution and finally a consideration of purchasing the full version, which could be described as the premium alternative. The model is often used for digital products or services that either feature network effects or are characterized as experience goods (Ploner et al., 2020) as it encourages the customer to start using the free version. The free part of the offer should create an incentive for the customer to upgrade to the premium version; this is done by limiting the free option in some way while still showcasing what is provided through the premium alternative. There are various ways to structure a freemium model, Panda (2019) and Pujol (2010) have both described ways to limit the free offer, with the most common examples being:

- Time limited - offering a set number of days for free before requesting payment
- Feature limited - the free version offers a base level of functionality while the more advanced or sophisticated version requires a premium account
- Seat limited - offering a limited amount of users per organization to use the service, users beyond the limit will be charged to the organizational account
- Capacity limited - offering a set amount of storage, requests per month or other measures of capacity for free

- Customer-type limited - offering a free version to specific customer types, these could be e.g. private citizens, students or smaller companies

It should be noted that this list and the limits it presents are not mutually exclusive or collectively exhaustive; there is nothing to suggest that these configurations can not be combined or that these are the only viable alternatives for freemium.

However, regardless of the structure, the free alternative needs to function well since a poor quality will reduce the conversion rate to the premium alternative (Jepson & Lundin, 2009) which is crucial for this model to be profitable. Further, freemium can be combined with other revenue models. The way the premium part is priced can be based on any other revenue model (Panda, 2019), such as those presented in the other sections. However, the free part needs to be completely free to avoid risks of bad will or loss of customers, according to Jepson and Lundin (2009).

By using the freemium revenue model it is possible to meet common challenges when trying to bring experience goods to market, according to Ploner et al. (2020). The authors suggest that by offering a free alternative, and thus reducing the barriers of entry and expanding the installed base, products that offer network effects will faster gain value. The growing population of free customers will also increase the conversion rates, both in numbers but also as a ratio, since the perceived value of the network increases with every user, given the network effects.

Holthe and Langø (2016) conclude that freemium is a viable option for the B2B market when targeting individual employees to acquire customers. However, Holthe and Langø (2016) found that the revenue model is likely to be even better suited for B2C than B2B. The main reasons for this include the more complex purchasing structure of firms and the higher likelihood of companies already having a budget dedicated to what they are trying to achieve.

One key consideration of the freemium model is the requirement of marginal cost to be as close to zero as possible. The vendor's cost for the free customers will need to be covered by the revenue from the paying customers, and since the free customer population often is close to 99 percent of the total user base (Jepson & Lundin, 2009), keeping the cost low for these is essential to be profitable. If this is not ensured, the freemium model could bring risk to the vendor due to increased costs without corresponding revenue (Jepson & Lundin, 2009).

Building on the necessity of effective incentives to upgrade, the differentiation of features between the premium and the free offerings and the trade-offs associated can be difficult to manage (Pujol, 2010). The balance will depend on what the strategic intent for the vendor is, growing the free user-base and increasing the installed base, or growing the premium user-base and increase revenue (Pujol, 2010). With the understanding that a more fully featured free product will increase the number of free users and reserving more features to the premium tier will increase the conversion rate, it is clear that the solution has to aim for a balance with the specific configuration depending on the customers, industry and market.

2.2.7 Trial

The trial model is highly related to the freemium model in that it is essentially a version of the time limited freemium configuration as presented in the list in subsection 2.2.6. Jepson and Lundin (2009) describes the main purpose of the overall freemium revenue model as to market the premium product, making the customers aware of what the premium product does but not giving them full access to these features. If the time limit in the trial model is not combined with any other measure, the concept is essentially to give access to the full premium product for a limited time, possibly going against what Jepson and Lundin (2009) argues is the key aspect of a freemium model. Datta et al. (2015) argue that this type of revenue model could be described as a free trial, especially since there is no free tier that the customers can remain in.

With the trial being a derivative of the freemium revenue model, many of the advantages, possibilities and considerations are inherently similar. While there is less of a demand to finance a continuous free tier of users, it is still important to ensure that the cost of adding trial customers can be kept as low as possible to not risk giving away something costly for free. Studying a B2C market, Datta et al. (2015) note several differences between customers who had a free trial period and those who did not. The authors found that the expected total value of a customer attracted by the free trial was lower than the value of a customer attracted by other means. Furthermore, the study suggests that a free trial could delay or decelerate the process of forming a relationship between the customer and the vendor, by using the evidence of higher defection rates beyond the free trial period (Datta et al., 2015). Notably, the study further indicated that that the free trial customers did not understand the value proposition of the service as well, due to a less developed relationship, as explained by Datta et al. (2015).

While the lifetime value of a free trial customer is lower, the total revenue or profit of the vendor could be increased if it is possible to recruit more customers to offset the lower value of each trial customer. This depends on low customer acquisition costs, and a big enough market with potential customers. As discussed with the freemium model, there are advantages to using a free option to recruit customers. However, if the trial experience does not meet the expectations it might alienate potential customers that could have tried the full service without a free trial at a later stage (Foubert & Gijsbrechts, 2016). These free options may also lower the customers' internal reference prices, and reduce the WTP for the full offer (Foubert & Gijsbrechts, 2016). While there are cases where this will harm the vendor, (Foubert & Gijsbrechts, 2016) found that the benefits of recruiting more customers could be higher than the drawbacks, but the authors express caution related to offering trials when the service is not fully ready. This could be detrimental, despite customers understanding that services evolve over time.

2.2.8 Pay-Per-Use

Harmon et al. (2005) describes the pay-per-use model as the customer paying only for what is being used, which could be based on any usage metric like time-in-use, peak period or the number of transactions. This is a typical revenue model for services that have become increasingly popular for selling digital content (Iveroth et al., 2013). A pay-per-use approach is often structured with a minimal setup fee in the beginning and then the rest of the payments are based on the usage metric (Harmon et al., 2005). Potentially, specific fees for service and support can be added if suitable. Gebauer et al. (2017) note that the pay-per-use model is similar to other emerging views like outcome-based services and result oriented product-service-systems. One part of the growing interest in pay-per-use models can be explained by the emergence of IoT devices that are leveraging sensors and billing systems to help with automatic metering of the use from which the payments are based, according to Sato and Nakashima (2020). As an example, the firm Kaeser Kompressoren uses IoT sensors to monitor the customers' use of its compressors and then charges per cubic meter of compressed air (Sato & Nakashima, 2020).

One of the main advantages of the pay-per-use model is that it is based on what is considered valuable for the customer (Ploner et al., 2020; Sato & Nakashima, 2020), which should be the usage metric that is reflected in the charge. Since successful metering is central to making the pay-per-use model work, it is important to consider that the solution is structured and sold in a way where the usage can be metered effectively and that the vendor has that easy access to the product or service remotely, as Ploner et al. (2020) argue. The key challenge with this is therefore to identify what usage metric creates actual value for the customer to be able to base the charging on it. An advantage for the vendor that directly follows the metering is that the pay-per-use model gives it information and insight into how the customers are actually using the solution (Sato & Nakashima, 2020), which can be leveraged to improve the overall understanding of its customers and in turn the offerings.

Further, the focus on the volume of usage of the product or service incentivizes effective consumption of the resources (Gebauer et al., 2017). This will enforce maximized resource efficiency as well as encourage a wiser use of the product. Thereby this might benefit both the vendor and the customer since it will likely result in a more productive operation overall.

Pay-per-use leads to an emphasis on the variable rather than fixed costs for the customer, which can be argued to reduce the customer's financial risk while also improving the flexibility and scalability (Ploner et al., 2020). Further, this implies that customers who might not be able to afford the solution by paying a large upfront can get access to it through lower, recurring payments (Ojala, 2012). Gebauer et al. (2017) additionally argue that this payment structure also lowers the initial barriers for the customers to use the product, especially in those cases where the customer preferences are not yet completely defined. The customers' lowered initial barriers are said to make the pay-per-use model beneficial when aiming for rapid sales growth (Gebauer et al., 2017).

Since the payments depend on the usage in the pay-per-use model, it is argued to especially benefit customers who want to use the product or service occasionally or for some specific purposes (Ojala, 2012), as they would not have to pay for the time the solution is not used. It might however be difficult for the customers to predict the future usage levels of the solution, and thus hard to predict the future costs. Therefore, for customers who aim to use the solution on a more discontinuous basis, a pay-per-use model might be appreciated according to Ojala (2012). Lambrecht and Skiera (2006) bring up the notion of flat-rate bias which highlights the fact that customers generally prefer a flat rate over a per-usage rate in situations where they have an expected pattern of usage, even though the total price might be the same. The authors argue that this is based on either a preference to avoid potential payment fluctuations, overestimation of the actual usage, unwillingness to have a ticking meter, or just for the sake of convenience of paying it all at once.

The uncertainty of the pay-per-use model holds for the vendor's side as well, where unpredictable usage levels yield unpredictable revenue streams. Compared to the subscription model, the vendor's revenues are more uncertain since the subscription payment is based on expected usage, while with a pay-per-use fee the customers are paying for the actual usage (Sato & Nakashima, 2020). Therefore, the vendor benefits from this model when the usage is stable and predictable, in contrast to the customers who benefit from this model when the aim is to use the solution occasionally. Further, it is common that the vendor takes responsibility for ensuring that the customers have access to the working products, which implies a risk of potential additional costs. Additionally, more time is needed to cover development costs through a pay-per-use model than through selling the solution directly (Gebauer et al., 2017; Ojala, 2012), indicating a further risk for the vendor.

Another aspect related to this model brought up by Ojala (2012) is the occasional lack of long-term contracts, primarily in software based pay-per-use models. The customer might benefit from this, since it provides with more flexibility to change vendor if not satisfied or if a better option occurs (Ojala, 2012). For the vendor, this implies an increased necessity of displaying and delivering the value for the customers to ensure that they keep on using the vendor's solutions.

2.3 Managing Revenue Models

As mentioned, the choice of business model, including the revenue model, is central to achieving a high performing business. There are multiple factors to consider in the decision of what revenue model is appropriate. Moreover, the largest differentiating factor in these decisions is the context of the decision, what the company is trying to achieve and what it is trying to sell.

Building on this, the context and how it impacts potential factors should be defined to help improve the decision making process. This thesis is, as previously discussed, looking at a manufacturing firm and how it can adopt and sell digital solutions effectively. This is an urgent matter for manufacturing firms, and if the servitiza-

tion is not efficiently managed they might miss the potential benefits and instead experience financial failure as noted by Ambroise et al. (2018).

Therefore, in the rest of this chapter important factors for manufacturing firms in the revenue model configuration that was found in the literature are presented to help guide the coming discussion.

2.3.1 Firm Objectives

There are multiple internal aspects that impact the decision of which revenue model is appropriate, where the objectives of the firm are one major part of it (Grunenwald & Vernon, 1988). Ploner et al. (2020) underline this by arguing that the business and operating model as well as the competitive and differentiating strategies play a large role when constructing revenue models. Iveroth et al. (2013) and Ploner et al. (2020) bring up the possibility to use the pricing mechanism to differentiate the firm in multiple ways, where Ploner et al. (2020) even argue that such differentiation can compensate for lacking product differentiation.

As an example of the impact of firm objectives, profit generation as the primary objective of the business unit has certain effects on the revenue model decisions. Grunenwald and Vernon (1988) argue that this objective can in turn lead to a preference of coverage of development costs in the initial phases of the launch of the digital product to achieve early profits through the revenue model. However, further down the line in the product life cycle when competition might have increased, profit maximization can instead be focused on defending the market share (Grunenwald & Vernon, 1988), which might best be achieved through other revenue model mechanisms. If on the other hand the firm objective is centered around achieving high sales growth by selling a lot of units, choosing a revenue model with lower revenue per unit sold but with the hope to achieve lower unit costs might be suitable (Grunenwald & Vernon, 1988).

Putting this in the context of digital solutions, the assumption that digitalization directly will drive profitable growth for manufacturing firms is potentially misleading, according to (Björkdahl, 2020). Many manufacturing firms are facing losses associated with digitalization, and Björkdahl (2020) instead presents the notion of focusing on features that enhance or act as complementarities to the core business. Building on this, it should be consistent with the strategy of the business, and Björkdahl (2020) found that successful companies are selective in what they are trying to do, understand what they are trying to achieve, and thus limit the amount of different concurrent activities.

Therefore, since different firm objectives lead to different revenue model preferences, it is relevant to consider those objectives in the decision of revenue model configuration.

2.3.2 Solution Fit

Understanding the solution that is supposed to be sold with the revenue model is essential, as discussed above by Grunenwald and Vernon (1988). As presented in the discussions of different revenue models, certain aspects of the solution will qualify or disqualify some revenue models. Examples of this are the ability to measure to enable charging per usage, or to differentiate the solution in different tiers to support a tiered approach, as mentioned earlier. Ploner et al. (2020) also notes that aspects such as costs will be important, and the discussion Jepson and Lundin (2009) offers on freemium supports this.

Aspects not presented in the revenue models that could impact the decision is the lifetime of the product, and that a shorter lifetime might require the vendor to ensure a faster payback time (Grunenwald & Vernon, 1988). Looking at digital services, the same consideration is valid despite possibly no hardware being included, since the lifetime of a service sold is only how long the customer uses it. Further, it is important to have a strategy regarding future updates and new features, whether these will be developed and if they should be included (Grunenwald & Vernon, 1988). This is especially important in the context of manufacturing firms and suppliers to the mining industry, where the core products of the manufacturing business have long lifetimes (Bartos, 2007).

Expanding the perspective, Langkamp et al. (2021) present the notion that understanding the use case is the first step of forming a good revenue model for a solution. The authors state that there must be a match between the use case and how the vendor will charge for the solution when discussing revenue models for IoT solutions. By understanding how the customers are able to create value with the product, it is then possible to understand how to create revenue. This concept is taken a step further by Langkamp et al. (2021), who argue that the same product or solution can be used in different types of value creation processes at the customers' sites. This then opens for different revenue models, based on what the actual value creation is.

Building on the discussion of delivering value that Langkamp et al. (2021) present, it could also be relevant to discuss the internal value that the vendor gains by increasing the installed base of the product. Even if the strategy of the firm is to not present or charge for this type of value internally, the concept of internal value should be considered when designing a revenue model. One way to view it could be as a form of network effect, where the value for the vendor increases when the amount of users increases, and networks effects should affect the revenue model design (Ploner et al., 2020).

Therefore, factors of the specific solution such as technical abilities and what use case is targeted need to be considered in the revenue model configuration.

2.3.3 Market Factors

A final set of considerations when designing the revenue model are the market factors. Ploner et al. (2020) discuss the importance of factoring in how the customers understand the solution and how it creates value for them. The customers' view of the product and how they value the different features of the solution are directly impacting how much and for what parts the customer is willing to pay (Ploner et al., 2020), which is of high relevance when deciding on the revenue model.

The customers' readiness and eagerness to use the solutions will impact which revenue model is appropriate, since the choice of revenue model impacts the incentive structure. The impact of the readiness is highlighted by e.g. Paiola and Gebauer (2020), who found that in multiple of the firms studied in their report, customer readiness was observed as a key obstacle or challenge in the launch of new, servitized, digital business models. Further, Fitzgerald et al. (2014) bring up customers being unready and unwilling to go for new digital models due to a conservative and change resistant nature. Thus, the possibility for a vendor to change to a new revenue model in the industry will depend on the customers' willingness to embrace and adopt this change and therefore this must also be considered in the configuration of the revenue model.

This readiness is especially important dealing with customers with a slower rate of innovation and related to this, the mining market has been described as stable and mature (Bartos, 2007). Björkdahl (2020) suggests that in stable markets, digital solutions targeting improved operational efficiency might be better than large transformations of the operations since these markets might offer smaller possibilities to grow through large transformations. The emphasis on operational efficiency over transformations is a clear market factor that affects both how and what to offer to these customers.

The context presents the notion that customers in the mining industry highly rely on equipment manufacturers to innovate for them (Bartos, 2007). Further, it was found that compared to other faster moving industries, the first mover advantage is not as present towards mining customers. This causes the adopter strategy, embracing new technologies after others have developed and tested them, to be the most prevalent (Bartos, 2007).

The structure of the customers on the market also plays a part in the revenue model design. A key to designing an appropriate revenue model is for the vendor to properly understand the different use cases of the various customers, as discussed by Langkamp et al. (2021). The authors further exemplify this by describing how one same data or IoT solution can be sold with different models to different customers, depending on the customers' characteristics. Thus, whether there are clear customer segments in the market can impact the design of the revenue model.

Therefore, factors on the market such as customer readiness and market structure will need to be considered in the revenue model configuration.

3

Method

In this section the research design and methods used in the study are presented as well as a discussion regarding the research quality.

3.1 Research Design

This study researches value capture strategies, in terms of revenue models, in combination with a case study approach of Company V to investigate and provide results on the research questions. Case studies provide in-depth assessments of the object of interest which give an intensive and specific analysis, according to Bryman and Bell (2011). This is in line with the aim of this study where Company V is the main case investigated.

A qualitative research design was applied, which according to Patel and Davidson (2003) is suitable when a deeper understanding of the subject is required. Additionally, Bryman and Bell (2011) highlight that qualitative data approaches often are compatible with case studies due to these inherent traits, which further motivates the use of the qualitative approach.

Since the purpose of the study is to generate and develop strategies as well as produce recommendations, i.e. to investigate something unknown rather than examine a specific theory, the inductive research approach is suitable. Bryman and Bell (2011) describes the opposite, the deductive approach, to be suitable when the theory is the starting point from which hypotheses are formed and examined through the study, a situation not applicable to this study. Additionally, as this study continuously combines data and theory, it can also be described as iterative as presented by Bryman and Bell (2011).

3.2 Data Collection

Both primary and secondary data were used during this study to reap the benefits from both types. Primary data collection has the benefit of flexibility as the structure of it can be designed to align with the purposes of the specific study, while secondary data offers more effective access (Easterby-Smith et al., 2015).

Different data sources and data collection approaches were used to answer the outlined questions addressed in this thesis. The structure of this is presented in Table 3.1 below.

Table 3.1: Research questions and collection method mapping

Type of information	Main data source
What types of revenue models exist?	Literature review
What revenue models are relevant for digital solutions in manufacturing firms?	External interviews, literature review
What aspects are relevant for designing the appropriate revenue model?	Interviews with Company V, external interviews, literature review
How does these aspects affect the choice of appropriate revenue model?	Interviews with Company V, external interviews, workshop with Company V, literature review
What are key considerations and implications to leverage those revenue models?	Interviews with Company V, external interviews, workshop with Company V, literature review
What is the future potential of new revenue models and digital solutions?	Interviews with Company V, external interviews, workshop with Company V, literature review

3.2.1 Primary Data Collection

Since this report is a qualitative study, interviews have been used extensively to gather primary data in addition to a workshop with representatives from Company V. For individual interviews in qualitative research, Bryman and Bell (2011) propose either unstructured or semi-structured interviews, where the former could be mostly described as a conversation with the interviewee. Both methods are flexible, but the semi-structured interview offers more standardized initial prompts to every subject and was the method employed in this study. The conducted interviews can be categorized into two main groups based on the type of interviewee, external experts of the subject at hand and people employed or in association with Company V, called internal interviews in this thesis. Before the construction of the interview template informal discussions were held with the supervisors at Company V to create a knowledge foundation, and after all other interviews an interview with the vice president was held to confirm any information and validate the level of confidentiality. Important to note is that no raw data from any interview was shared with anyone at Company V. The internal interviews were held in a continuous manner spanning over the whole data collection phase to update, compare and deepen the insights gained from theory and later also with the external interviews. They had the objective to understand the background and inherent principles of the problem and the firm to be able to verify and improve the solutions proposed in this thesis for Company V specifically. The external interviews were held later in the process to get additional perspectives of the subject and to fill any potential gaps.

In total, 12 interviews were held remotely with internal Company V personnel. In addition, four experts on the subject from external firms were interviewed to get

other perspectives. An overview of the role descriptions of the internal interviewees can be seen in Table 3.2 below, with roles of external interviewees presented in Table 3.3

Table 3.2: Overview of internal interviewees

Role of interviewee	Date
Product Manager - Digital Services	2021-02-23
Product Manager - Customer Telematic Solutions	2021-02-25
Regional Manager - North America	2021-03-02
Regional Manager - Australia	2021-03-02
Regional Manager - Africa	2021-03-03
Regional Manager - South America	2021-03-04
Sales & Business Development Manager - Australia	2021-03-04
Regional Manager - North America	2021-03-05
Product Manager - Digitalization	2021-03-08
Technology Platform Manager – Digital Business	2021-03-10
Business Developer - Tunneling Intelligence	2021-03-15
Business Developer - Mining Intelligence	2021-03-15
Vice President - Digital Business	2021-03-17

Table 3.3: Overview of external expert interviewees

Role of interviewee	Date
Vice President - Data Driven Services	2021-03-30
Director - Group strategy & Ecosystem Development	2021-04-14
Technical Sales Lead - Mining	2021-04-14
Principal Researcher - Business Models	2021-04-14

All interviews were performed online which had the advantage of providing flexibility since no transportation was needed. The interviews were recorded, after acquiring permission from the interviewees, and all interviews were transcribed or extensively noted down to be able to leverage as much information as possible and to not miss any crucial points.

The semi-structured interviews at Company V were conducted using a framework of questions containing the following five main categories:

1. The current digital offerings of Company V
2. The attributes of digital solutions

3. The customers perspective
4. The internal perspective in Company V
5. The revenue models of digital solutions

Questions addressing aspects of these categories were initially developed before the first interview under the basis of what the authors believed to be useful for the report. This development was based on the information gained from the extensive literature review, work that had been done before the interviews, and information from informal, confidential, interviews with personnel at Company V. Since the interview subjects could be categorized into different types of roles at Company V, prioritization and selection of questions were performed for each type of role. Further, the framework of questions was improved based on knowledge gained from the held interviews. This was possible due to the fact that semi-structured interviews allow the interviewee to expand on the questions. Some of the information gained from these discussions was deemed to be of high significance and was thus added to the framework as an own question for the following interviews. The final revision of the interview template can be found in Appendix A.

External expert interviews were used in this study in accordance with the advantages to elite interviewing as defined by Richards (1996), primarily providing access to information not recorded or available in secondary sources. Additionally, such interviews could open access to further interview subjects associated, such as colleagues or in their respective professional networks (Richards, 1996). Therefore in this study, these types of interviews were used to verify and expand the knowledge found in the review of the secondary data to allow for a complete informational basis for the discussion. However, the nature of expert interviews is related to a challenge regarding a reduced number of interviews possible due to risk of limited access to subjects or willingness to share information with researchers publishing a report, where sampling could be an issue (Richards, 1996).

To mitigate this risk, the crucial expert interviews were extensively planned for and communicated with a longer time horizon to meet the potential unavailability of the experts. Such access presented by Richards (1996) was used to allow for additional interviewees with further knowledge of the areas in question. The interviews followed the same semi-structure as mentioned above and the questions can thus also be found in Appendix A, however questions targeting Company V were removed or rephrased. Further, since the expert interviews were conducted after most of the internal interviews it was possible to focus on areas where Company V internally lacked knowledge or experience.

After the interviews at Company V and the external firms, a workshop was held with several managers of Company V. The purpose of this was to enable creative discussions primarily based on chapters 5 and 6, after a brief theoretical background from other chapters of the thesis. These discussions helped with getting different perspectives on discussion points in the thesis, but also providing creative ideas

and thought-provoking questions regarding the implications of the thesis. Further, it helped to ensure the alignment of the thesis with the reality of Company V, in addition to the research purpose.

3.2.2 Secondary Data Collection

Academic literature was used to give a theoretical foundation for the study to help answer the research questions. Since the aim of the study is to help Company V solve an issue identified in the organization, earlier internal studies mapping the organization and innovation processes to discover its shortcomings were also used as a pre-study to help guide and form the overall data gathering and analysis. Other non-academic materials from Company V and the industry, such as company and industry reports, were used to provide more specific information related to the case and to complement the existing literature.

Academic literature in the form of articles and books was the primary focus in the starting phases to form a theoretical ground to further build on. Easterby-Smith et al. (2015) suggest that reviewing existing literature within a subject helps to discover what is already known while also providing a basis for evaluating the study's results. In the later phases, the literature was continuously revisited and referenced to strengthen the understanding of the subject and improve the validity of the results. Keywords and phrases were chosen to be able to identify relevant material for the literature review, e.g.: value capture, digital value capture, manufacturing pricing digital products, digital business revenue model.

Non-academic material provided by Company V worked as another key secondary data source to get information about the firm, its current position, and its standpoint. This material included strategy documents, internal and external reports, as well as results from earlier related studies. Easterby-Smith et al. (2015) bring up challenges with accessing these types of data, and that it is therefore important to develop a good and transparent relationship with all actors involved which was emphasized during this study.

3.3 Data Analysis

The purpose of the data analysis is to combine the relevant information gathered in the different parts of the data collection to be able to discuss and form the recommendations. One challenge of qualitative research is the amount of data generated (Bryman & Bell, 2011); thus effective tools to process and analyze the data are required.

The transcribed data from the interviews was codified to make it easier to find common concepts and to draw insights. Coding is a common technique to make unstructured raw data more structured and easier to process (Bryman & Bell, 2011). Commonly occurring phrases from the interviews were highlighted and key information from longer answers based on open questions was extracted.

The information collected from the secondary data collection was documented in a similar manner. Easterby-Smith et al. (2015) suggest creating summary records for the literature review to make it easier to compare, analyze and synthesize the text investigated without having to handle too much detail. This method was employed and summary records were created for the academic literature used during the study where the key message and contribution of each article were documented and then categorized according to the different subjects. The same process was applied to the non-academic material when appropriate. This way, the information from the secondary data was made more structured and categorized to make effective use of.

The structured data from the different primary and secondary sources was combined and compared in the analysis to answer the research questions and fulfill the purpose of the study.

3.4 Research Quality

The quality of a research study is commonly determined in terms of validity and reliability (Bryman & Bell, 2011). One way sufficient validity was reached in this study was by leveraging triangulation, which is presented by Bryman and Bell (2011) as the combination of methods or data sources. By combining and comparing theoretical information from the academic literature with the empirical data from the different interviews and material, multiple reference points were obtained which enabled a more valid result.

To further ensure and improve the internal validity of the study, i.e. how well it represents reality (Noble & Smith, 2015), the results and the analyzes were presented and discussed in an iterative manner with key representatives from Company V as well as during the workshop. This created opportunities for feedback and ensured alignment with the organization's position and goals.

Bryman and Bell (2011) argue that a common pitfall for qualitative research is that it can be too subjective, being affected by personal relationships and prioritization. To handle this, a systematic approach and method for both the data collection and analysis was formulated in the initial stages, which along the line was continuously evaluated in relation to the purpose of the study.

4

Findings

In this chapter, the findings from the interviews are presented subject by subject, corresponding to the structure of the interviews. As discussed in chapter 3 the external interviews followed the same overall structure, but the findings from those are presented in a condensed separate section, section 4.6.

4.1 Digital Solutions Offered by Company V

In all internal interviews, the first topic covered was digital solutions including the interviewee's perception of them, the current offerings and the future for Company V.

4.1.1 Current Offerings

The portfolio of digital solutions offered by Company V today was described by the interviewees as including raw sensor data from the equipment, a web portal for visualization of the data, APIs for this portal, as well as customized dashboards. All current digital solutions are centered around the data produced by sensors on the equipment. Since the sensor data is very central for each digital solution Company V has developed sensors for each equipment type. The sensors are currently included in the equipment sale to ensure that all machines that are sold have a sensor attached to enable full fleet connectivity as a future option. Further, Company V offers retrofit solutions of the sensors to be able to connect machines that were sold earlier without sensors, which is highly relevant due to the long lifetime of its equipment. The sensors and the related digital solutions are planned in the long term to become OEM agnostic to function with all other equipment on the customers' sites.

The sensors produce a wide range of telematics data, including e.g. usage and wear metrics such as engine hours, fuel consumption, and drill meters. This data is the foundation for the other solutions but has also previously been offered in its raw format if requested by the customers. However, most interviewees brought up that looking forward, a shift of focus towards selling insights and analytics rather than data is the way to be successful. This is because the raw data is perceived as of little actual value to the customer, and it can be difficult for the customer to interpret it effectively. Therefore, Company V is trying to move away from selling data in this raw format.

The sensor data can be displayed through a web portal offered by Company V which packages and visualizes the data in an appropriate way. While not always charging for the portal, it is currently offered through two levels of tiers, one basic version and one upgraded alternative called the professional version. What type of data is available on the portal depends on the connected machines, as different machines

produce different types of data, and which version of the portal the customer has. The standard version of the portal only gives access to the more basic data, which includes total tonnes transported/meters drilled, engine hours, and fuel consumption in total liters. For the customers of the professional version of the portal, more detailed data regarding operation (e.g. drill meters per hour, tonnes transported per bucket, utilization, drill cycle, fuel consumption, location data) and maintenance data (e.g. predicted date to next service, number of machines overdue, active alarms) are also included. This data is displayed on the portal as tables but also in suitable graphs.

Currently, the web portal is intentionally kept standardized for all customers to keep it scalable for Company V. There is however a possibility for customers of the professional package to create their own widgets directly on the portal to effectively display the most prioritized data in the portal, which give the impression of customization. On top of this, customers can get notifications or alarms when something happens, e.g. engine fuel pressure warnings, as well as daily or weekly reports based on the areas they are most interested in. This could include an overview of e.g. total emissions, alarm frequency, or hours left to the next service of the equipment. If a customer wants more than what is offered in these packages, such as integration service, it is possible to get this as add-ons to the portal. The portal thus offers the customers a better short- and long-term understanding of their machine fleet and how it is used by enabling access to this data. The customer can then become more efficient in its operations by looking at this data and making improvements based on insights from it.

Further, Company V offers APIs to the portal, which makes it possible for customers to get the equipment data into their other systems without having to rely solely on the web portal earlier described. This improves the OEM agnostic aspect of the digital offerings as the data can become compatible with other systems through the APIs.

Finally, dashboards with data designed for specific customer use cases are also offered by Company V. While the portal is, as mentioned, intentionally kept standardized, these dashboards are highly customized according to what the customer is interested in. The dashboards are often designed and configured together with a customer in projects where the customer is able to model the base in the appropriate way and implement specific modifications. Here, similar use cases as with the portal can be approached with alarms and notifications to support productivity or effective maintenance. These dashboards can be combined with automation use cases to monitor the equipment but are also considered a part of the digital business, according to the interviewees.

Adjacent to the data and software solutions presented are installation and onboarding services related to the digital solutions that Company V offers. While these are not technically digital solutions themselves, they are often offered in combination or as a complement to the digital solutions when sold to the customer, and constitute an important aspect of ensuring that the solutions are used in an effective

way. One sales and business development manager said, regarding integration and execution of the digital solutions, “Not everyone wants onboarding and installations but Company V has to have that capability to offer it to the customers that want it”.

During the discussions about digital solutions, several interviewees also mentioned what is called planning software which uses machine data to monitor and plan the use of the equipment. The planning software works close to the machine and uses the machine data to help the equipment work efficiently on a day-to-day basis. However, it has an operational scope and is used close to the machine instead of stand-alone for analysis as the sensor data is. Therefore, this is not considered a part of the digital business unit and thus not to be classified as a digital solution in this case. Other offerings brought up during the interviews outside of the defined scope of digital solutions consist of the offerings of the other brands under Company V.

Looking forward, Company V sees the possibility to extend the features of the professional tier of the web portal, where data from several machines can be combined to e.g. better predict when maintenance is required and thus increase the involvement of Company V at the customers’ sites. Further, Company V has other brands which use and produce equipment data with other focuses, e.g. a brand that is specialized within machine location. One interviewee brought up the possibility to in the future integrate that data as well in the web portal to extend the value created for the customer.

4.1.2 View of Current Solutions

The view on whether the digital solutions are hygiene factors or work as differentiating factors for the equipment sales is divided among the interviewees. Some view the digital solutions mainly as a supporting part of the equipment sales which they predict never will be a big separate value- and revenue driver on its own. They however highlight the necessity of offering digital solutions where the expectation from the customers is that Company V must be able to provide data. “It is not about selling software. The core is machines and Company V wants to do it in a better way. However it will only lead to selling more machines” one business developer mentioned during their interview. Therefore digital solutions can be seen as primarily a hygiene factor, or as a complementary service. On the other hand, other interviewees argued that the digital solutions have a value-adding role in the portfolio rather than a supporting one. One interviewee perceived it as possible to sell the equipment without the digital solutions, but that in the long term, Company V would become irrelevant without it. Although the view on the digital solutions’ strategic position in the portfolio is somewhat divided, all interviewees agreed on the relevance of digital solutions and the importance of pricing it right.

Three of the interviewees that view digital solutions as value-adding expect the provision of insights to be the key profit driver looking forward. This includes e.g. insights into why equipment does not last and what can be done about it, not solely offering pure data on it. Thus, if the digital solutions aim to be stand-alone

as key revenue generators, the focus on insights and information rather than data is expected to be highly essential. On the other hand, other interviewees predict that the equipment, not the digital solutions, will remain the key profit drivers for Company V.

Looking forward, the interviewees brought up the importance of having all equipment connected and focusing on the usefulness of the digital solutions. Several interviewees noted that the required technology is already available, but that not all machines are connected and that the digital solutions are not being sufficiently used by the customers. Having all machines connected is considered the first step towards being able to offer more valuable data and derived insights. Additionally, some interviewees imagined that industry benchmarks derived from the telematics data would be an interesting selling point in the future, where customers can be informed of how they are performing compared to others, to learn what areas of their operation are falling behind the competition.

The majority of the interviewees highlight the challenge of communicating and convincing the customers of the value of the digital solutions. Compared to the traditional equipment, the value of digital offerings is less tangible as well as hard to define and predict. Additionally, the customers are used to purchasing expensive machines and equipment but might not be as experienced in digital solution procurement, which can make them hesitant towards it. It might also be harder to argue for development costs of software than for building a machine due to this, since the perceived production cost is close to zero for software units. Therefore, being able to showcase the value through previous success stories or use cases was highlighted as crucial to succeeding with selling digital solutions.

4.2 Attributes of Current and Future Digital Solutions

The industries that Company V currently operates in are considered fairly stable when looking at the usage of the equipment that the company sells. While there are some cycles when it comes to heavy investments by the customers, all customers across the industries try to maximize the value from the equipment. Mining customers are argued to be mostly focused on the throughput of the machines, but other industries such as construction have the core focus on machine availability.

Building on this, the different types of customers create a variety of challenges for Company V. The willingness and resources available for digital change management differ between smaller and larger mining customers, but the focus on output is still prominent. Further, the challenge of equipment connectivity is significant in mining compared to other industries. It requires the utilization of customer networks and sometimes local servers which can be especially challenging in mining environments. “It is entirely dependent on the customers’ networks, and the customers’ IT department” said a manager from experience, continuing “there is a need to prevent an increase of the workload of customers’ IT, not introducing more things to fix”. Thus,

Company V is highly dependent on customer networks in the mining industry. In contrast, construction equipment can often be connected through mobile networks which often is easier to manage. This connectivity challenge creates higher costs per machine for Company V, and the focus on availability currently requires different solutions to be offered.

The investment needed by the customer to embrace the digital solutions bought from Company V is argued to create a lock-in effect, which reduces the need to create other technical lock-in factors that could potentially upset customers. The main investment is not described to be of financial character, instead it is the effort from the customer that could be described as a project requiring the customer to change and adapt. Employees need to be trained and the operations must be adapted to utilize the value offered by Company V, which creates the lock-in when it is done. If this change process succeeds and great value is proven, the combination will support a lasting relationship.

When it comes to the marginal cost of adding another digital solution customer, there are three factors mentioned as main drivers: digital, onboarding and hardware. The digital resources, such as servers, are fairly close to a marginal cost of zero. Regarding onboarding, some interviewees that work close to the customers described a need for training and customizing the solutions but that the importance of this decreases if the customer is more digitally mature or large enough to afford an in-house development team to perform this. Further, custom solutions developed for specific customers could be at least a partial match for other potential customers of Company V with smaller adaptations, and in turn decrease the marginal cost over time. Since many of the solutions offered by Company V are based on data from equipment, the cost of sensors and setup to ensure the machines work is a clear marginal cost. However, if the sensors come pre-installed and are used for other purposes, the actual marginal cost of enabling the digital services could be low.

The value of the digital solutions by Company V will increase as the adoption rate increases, according to interviewees. An example given was that the first installations will help to prove the value offered by the solutions which would help with coming sales. Further, if a customer is paying for the development of a digital solution, the solution can be provided to all customers afterwards and thereby increase the overall value of the platform. Looking instead at the value of the data from the machines, two clear network effects were identified. The digital solution will be able to use aggregated data to provide operational insights to specific customers, and the value of this increases with higher quality and amount of data which comes naturally with a larger active installed base. Further, the same increase of data will improve the internal business of preventive maintenance, which is very central for Company V. Many of these effects are dependent on the number of connected machines and customers, not on the amount of paying customers. Thus, it is possible that Company V could gain these network effects without increasing the amount of paying users and solely focusing on the installed base.

As discussed previously, there are differences across industry segments and even

within segments. Building on this, there is a clear view inside Company V that it is possible to differentiate the digital solutions into different products, through offerings or tiers. A possible differentiation discussed would be to start with a standard package of data from the machines, and then offering more premium packages with operational insights or other custom solutions separately, similar to how the portal is offered today. The view on pricing, including whether some of these tiers should be free or not, is not as clearly aligned across the interviewees. However, the differentiation could cause standard tier customers to be dissatisfied with the solution. This could create a risk that customers get the impression of the solution being quite limited, which would alienate them instead of creating an incentive for them to upgrade, according to an interviewee.

The high importance of being able to prove the value is likely a function of both the industry being overall hardware focused and the digital solutions being new in themselves. Most interviewees agreed that it is not strictly an experience good in the sense that the customer needs to experience the solutions on their own operations to be convinced about its value. However there is a need to properly educate the customer regarding the possibilities of the solutions from Company V, and then to show that this value can be proven. The key is to “make the intangible parts tangible”, as one manager expressed it, and suggestions ranged from case stories, demo sites to free trials.

Being able to measure the usage of the digital solutions is a key aspect of several revenue models and several different ways were discussed in the interviews. Cloud based solutions have many different measurement possibilities, for example, metering the number of users accessing the system or the active usage of different APIs. In a decision on what to measure it is important to define how this is related to the value for the customer. Therefore, this rules out arbitrary measurements such as the number of clicks on the platform as it is not considered a value driving metric. In addition to the cloud solution, it is possible to measure directly at the customers’ sites. The most straightforward way is measuring the connected machines, both the number of machines connected as well as what functions are used and how. Further, Company V is working on getting these measurements to work at sites with local servers, where internet connectivity could be limited. This would allow these measurements to be used in revenue models for all customers, not only those with direct connections to the cloud.

4.3 Customer Perspective

In this section findings related to the customers’ perspective on digital solutions and revenue models that were discussed with the interviewees are presented.

4.3.1 Customers Perspective on Digital Solutions

The mining customers and the whole industry are perceived as slower with the adaptation of digital solutions and digitalization in general compared to others, according

to a product manager. However, the majority of the interviewees mentioned noticing a trend in an increasing digital acceptance and a growing fear of missing out from the customers' side. "In the mining industry the customers have big expectations about digitalization", as one regional manager put it. They further argued that this trend is expected to grow even more in the coming years.

When asking about which sides and in which ways the customers value digital solutions, several aspects were brought up by the interviewees. The customers are perceived as relating all value from Company V to the equipment and therefore the key value lies in digital solutions focused on improving the equipment. Improved safety in the operations is another aspect that one interviewee argued that customers value with digital solutions. Further, the interviewee also noted that customers see a value of achieving a higher return of investment as a result of improving the equipment through leveraging digital solutions for asset health and operational efficiency.

The customers in the construction segment were argued to have another priority in what is valuable, where one key value driver of digital solutions is in the ability to log the work that is done. This is due to the fact that those customers create invoices based on the quantity and quality produced by them, and having a digital log for the work performed provides much value and efficiency in this for them. More than that, a business developer brought up that customers value being able to move the equipment across sites in a seamless way without having to reconfigure them, which can be done through digital solutions.

When it comes to what the customers actually request, it primarily comes down to getting access to data, insight into how to use the equipment efficiently as well as a slight interest in benchmarks. However, there is an identified lack of understanding on how to use the data and the digital solutions, where some customers request access to all data without knowing what that data is or what to do with it, which does not make them satisfied. "Customers are saying that they are data rich but information poor", one product manager stated. Even though these aspects have been highlighted as requested by the customers, there is an uncertainty on whether the customers are actually willing to pay for this. An example of this brought up by one interviewee is that it is common that customers think they own the data produced by the equipment, and become unwilling to pay for anything using that data as a result of this.

Building on this, there is a challenge identified in making the customers understand and use the digital solutions they have bought. Multiple interviewees mention that customers lack a holistic understanding of the digital solutions related to the whole system. As a result of this they tend to refrain from using the digital solutions, where one mentioned that it is common to be 3-4 unused systems in the customers' control rooms. Further, several interviewees also noted a tendency of customers not repairing parts on which the digital solutions may rely, e.g. the sensors. In mines, the wear and tear of components is very high and without the ambition to repair the sensors the digital solutions will fail. Another aspect blocking the customers from fully using the digital solutions is the varied connectivity on their part earlier

discussed where it is the customers' responsibility to ensure sufficient connectivity at their sites. Without the interest and investment from the customers when it comes to these aspects, the digital solutions will remain unused or even unusable. However, some interviewees mentioned that there is some degree of variation across customers when it comes to this, where some customers are more mature than others and thus are better at understanding and using digital solutions. Several interviewees put emphasis on the importance of offering training and onboarding to help the customers get started and really understand the solutions, but also to keep the solutions very user friendly and easy to understand.

To succeed with digital solutions it is important to approach the right customers, and in the right way. In other words, there is a need for correct segmentation. The interviewees argued that there are differences across customer segments since capabilities, digital maturity, as well as the view on money and investments differ across the customers of Company V which impacts the adoption of the solutions. Several interviewees made a distinction between customers of different sizes and said that the size of the customer directly impacts the factors mentioned before. The largest customers are perceived as doing their own thing and viewing Company V solely as a vendor and thus have less interest in committing to a larger digital solution project together with Company V. The process of change management is also larger and slower in the big customer firms. Additionally, large mines have been noted to expect discounts and special offers due to their size. On the other side of the spectrum, the smallest customers might not have sufficient budgets to invest. However, it is easier to align objectives and expectations in smaller mines as a result of their size. These two types of customers thus differ on some aspects and should therefore be approached in different ways. Based on this, two interviewees suggested that the medium sized customers are attractive to approach with digital solutions projects due to their likely capacity and capability to change and invest in new technology.

4.3.2 Customers Perspective on Revenue Models

The customers are perceived as appreciating several factors when it comes to new revenue models where the investment is not solely based on an up-front payment. One feature identified as valuable for some customers is the shift from CapEx to OpEx in new revenue models. This shift also means that since no big investment is needed to get started with the solution, it is possible for the customers to try multiple solutions from different vendors to decide on which is the best. There is also a value, argued by a regional manager to be the biggest, for the customer of not having long-term contracts, which otherwise often is the case. In e.g. a subscription model, customers are observed to value the flexibility of turning the subscription on and off easily. Other aspects valuable for customers with the subscription model can be upgrades and support that can be included, as well as the possibility to give feedback that is acted upon by Company V.

Some interviewees brought up that some customers are expected to keep viewing the digital solutions solely as a part of the equipment purchase, and that it therefore

might be hard to capture any additional direct revenue from the digital solutions. These customers are argued to view the local data gathering as a necessary and natural part of the equipment, not as a stand-alone offering. Some customers might even expect to get the digital solutions for free as a result of this. “People expect to get things for free, looking at it as a future revenue source is a bad starting point” was expressed by a regional manager regarding this.

When looking at the customers’ purchasing process there are some aspects where digital solutions differ from traditional equipment procurement. Firstly, the budget for digital solutions and software often lies somewhere else in the organization. Who the primary decision maker is and which budget is affected depends on what use case the digital solution is targeting. Secondly, the purchase can be either OpEx or CapEx targeted, compared to machine purchases which are pure CapEx. Depending on what budget structure the customer has the digital solution can either be sold up-front bundled with equipment and thus be a CapEx. However, if the customer’s CapEx budget is already reached the solution can instead target the OpEx through e.g. a subscription model. A business developer mentioned that it is easier and quicker for the customers to make decisions on OpEx than CapEx. Customers might even be willing to pay a larger total price for an OpEx focused model to avoid the large investment cost, according to another interviewee. On the other hand, one interviewee argued that capital investments could be easier for the customers since that is what they are most used to. Finally, a regional manager highlighted that the customers are used to paying recurring fees from other vendors, and thus have administrative systems already in place for it. They are just not used to do it for the products from Company V.

The customers are argued to put more emphasis on the total cost of ownership for digital solutions, especially when using new revenue models. Thus, they are more aware of the recurring operational costs and not just the investment, which makes it important to have a holistic view of the offering as it becomes a larger factor in the decision process. However, one interviewee offered a counterpoint by mentioning that so far the price has not been a negotiation point when selling digital solutions to the customers, whether they value and want the solution or not has been the sole focus. Building on this, customers put the highest emphasis on the pricing being linked to the value that is created by the solution. Overall it is important that the customers can observe the value that is created, if they do not understand or see it they will no longer be interested in the solutions.

4.4 Internal Company V Perspective

In the interview with the vice president of the digital business, the overall strategy and objectives of both the digital business unit and in relation to Company V overall were discussed. They made it clear that the current goal of the business was revenue growth, to ensure that the digital solutions gets the opportunity to accelerate and take a permanent place in the overall strategy of Company V. Thus, the current goal is not centered around profitability, since the view is that revenue is more urgent

than good profit margins in this phase. As discussed briefly in the current offers of Company V, the vice president also argued that OEM agnostic solutions will be an important part of the objectives of future digital offers by Company V.

For Company V some internal issues were found when discussing primarily a shift to models with recurring revenue, with the firm not set up to send automatic invoices of smaller sizes. For this concept to work the cost per invoice must be low, and the connection to the digital solution should be automatic, to minimize the costs involved. Combining all invoices over a year and thus charging per year was suggested to combat the potential internal struggles of invoicing every month or quarter. Further, there is a concern that the internal sales teams do not value the digital solutions enough, and in some cases thus are giving them away for free. It was suggested that the sales teams should pay for the digital software they sell, in the same way as the hardware they sell, to ensure that entire Company V organization emphasizes the value of digital solutions. This also tries to combat the issue of trying to charge for a solution previously offered for free, an issue brought up by the interviewees.

The issue of a sales team that does not value the digital solutions is caused by Company V being a traditional manufacturing firm. The current software business of the company, primarily the planning software mentioned in section 4.1, is essentially sold as a license for a one time fee included in the machine sales. This creates no incentive to provide maintenance or keep a good relationship with the customer, two aspects that are necessary for digital solutions such as the portal. Especially since the connectivity of the equipment is dependent on the customers' network solution in the mines. Another issue, according to some interviewees, is the lack of an internal understanding of what the value of digital solutions is beyond the sales team. "No one can tell the CEO where the value proposition of this is. There is a pool of good data and potential revenue streams from it but no one can package it for them. No one understands what the value of the data is" one interviewee said, showcasing this issue. If the organization overall is unable to understand the value of data and the possible revenue streams, it is not possible to guide the firm to embrace this new potential of the industry.

While there is a lack of organizational understanding of the value from digital solutions, there were at the same times many ideas among the interviewees on the value the solutions could bring internally to Company V. Directly linked to the issue with selling software as a license earlier discussed, moving to continuous revenue will ensure that the product will get continuous updates and improve the relationship with customers which can be considered valuable for Company V. Further, there are many different internal values based on the data gathered from connecting the equipment, primarily in R&D, sales and maintenance. For Company V to be able to understand the fleet performance will help the development of new products even outside of the digital business unit, where improving the management of equipment batteries being one example brought up by an interviewee. Further, as discussed earlier, effective predictive maintenance is possible with good data streams, and will be further improved with more data. This will even allow for supply chain

improvements, shipping replacement parts before they are needed.

While these examples of uses primarily are based on aggregated data, there are also clear valuable cases leveraging specific user data, albeit a bit more complicated due to potential privacy concerns. The data on customer operations and how equipment from Company V is used could help to create a custom sales process for machines, with offerings specifically tailored to what the customer's operation needs, not what the customer believes it needs. Another suggestion was to use specific customer data to log misuse before any warranty claims, possibly compensated with longer warranty periods for customers that prevent misuse. This could also be of value to third parties such as insurance companies. However, the sale of data to third parties was commonly dismissed by interviewees, especially in the shorter term perspective. In addition to the difficulties of evaluating data to third parties, many interviewees highlighted the big challenge of quantifying internal values of the data, especially since it has not been tried yet.

This challenge is highlighted by the comments on how to capture the internal value, with no real consensus among the interviewees. Conceptually the internal R&D could be viewed as a core customer of the digital business unit, argued a regional manager. This would also help with company investments into getting higher quality data from the machines. However, many view it as difficult to internally charge for the data, both organizationally but also how to quantify and price it. Organizationally, digital is still second to the core business of selling equipment, it is much more important to get the machines running at a new customer's site, connecting them is at a clear second place, according to an example given in an interview.

It is also important to focus on the user experience, since the customers are unfamiliar with digital solutions in comparison with regular purchases. Building on this, some interviewees suggested that starting with simpler solutions such as a few dashboards will allow for the establishment of relationships and form easier ways to test revenue models, but selling insights as soon as possible was also highlighted. If Company V is able to charge for insights, it will create an incentive to develop even better insights to customers, and thus create a positive feedback loop. The need for a global approach with local adjustments was also mentioned, especially related to the need to listen to customers. This could also be caused by the local sales offices observing different customer characteristics compared to the global picture of a customer that Company V is trying to establish or project.

4.5 Revenue Models

Company V currently has a revenue model configuration that offers the digital solutions as licenses which often are given away for free, offering free trials in some cases. The licenses span over 1-5 years and are usually offered on a per site basis to the customers. They are structured around either monthly or annual fees depending on the market. However, as said it is common that these licenses are given away for free together with the equipment and the paying customers are currently few.

4. Findings

Recently, a standard and a premium version of the portal has been developed with the aim being to start charging for licenses for the premium version. In some cases Company V offers a one month trial of the digital solutions for the customers buying new equipment. Then the standard dashboards are shown together with the portal to give the customer an opportunity to see whether it is interesting for them or not before potentially investing in it.

The biggest issues with the current revenue model configuration stem from the fact that the digital solutions arbitrarily have been given away for free. Interviewees argue that when giving away something for free it gets difficult to start charging for it after a while. If you want to make that transition you must have been clear with that from the start towards the customers to not upset them. The main issue with this is that when the solution is given away for free it is perceived as having less value and thus potentially causing customers to care less about it. Further, the customer does not have to be as engaged when it is free and the wrong customers might thus be approached. Company V should optimally focus on the customers that are motivated to change and thus willing to pay for it, according to interviewees. Additionally, when the digital solutions are given away without charging for them there is less incentive for Company V to keep developing and updating the solutions. Finally, offering it for free results in resources being spent without gaining any revenue for it which in the long term might get problematic.

However, the interviewees see some opportunities with new revenue models. A revenue model leveraging subscription where customers would pay for the solution would offer a more active and close relationship between Company V and the customers, working together on improving it. The customers would be likely to give more direct feedback on the solution which would be beneficial for both parties. There would be more incentives for Company V to teach the customers to use it in an effective way, since it would be important to keep the customers engaged, and the customers would have more incentives to actually use the solutions, since they are paying for it. Further, it would be possible to ensure that broken components get fixed so that the digital solutions keep working and getting used. Additionally, a subscription model that works would contribute to stable revenue for Company V over time.

These opportunities also bring some challenges. One product manager argued that the main challenge is creating a good incentive structure with a new way of paying. Related to this, the customers have high barriers of up-front expectations when considering digital solutions and therefore getting them on board should be the focus instead of cramming out the maximal revenue from them right away. More practically, there is a risk of Company V not getting enough revenue through new revenue models and it might be harder to predict when and how to reach certain levels of revenues. Additionally, many alternative revenue models include risk sharing with the customer, which implies that it could be problematic if the system breaks down and Company V is responsible for it, especially if the firm does not have procedures set up to deal with this problem.

Interviewees expressed that some of the challenges of new revenue models could be mitigated by already existing aspects of Company V, especially the brand. Such a globally known brand instills confidence in customers to try new revenue models or solutions, compared to any startup exploring the same business model. Further, being an established supplier will help both in sales but also in connecting machines through customers' networks. However, most of these advantages were presented as comparisons to startups, comparing to other established brands such as the core competitors of Company V's machine department indicated no advantages. Rather, the lack of experience in developing and delivering software and digital solutions was presented as a disadvantage.

Building on the advantages of Company V the expressed needs from, or informal conversations with, current customers gives information that can help Company V in the development of new revenue models. Customers have expressed an interest in the increased flexibility that new revenue models can offer, according to interviewees. This was also linked to reducing the CapEx required and instead shifting those costs to OpEx as payment over time linked to the operation. One customer even brought a specific revenue model to Company V, wanting an all inclusive subscription model with both digital solutions and the hardware necessary to support it included. However, other customers are still unsure, with some using this insecurity as a negotiation point to get trials from Company V.

The trend of subscription based revenue models is also affecting customers of Company V, though it is noted that such trends do not primarily originate from Company V or its competitors. Instead the source is from suppliers that operate in other types of industries such as software, and customers are learning to accept and deal with such revenue models based on this. This can create a different perspective on the overall revenue models, with interviewees in customer facing roles getting questions from customers based on what they learned when working with companies such as Microsoft.

Evident from the interviews is the difference between different customers of Company V, and likely also the size of the digital solution installations. Thus, how to scale the pricing with regards to this was also discussed. Scaling pricing for a specific customer is closely linked to the discussions on possible tiers, i.e. offering different offerings at different price points. The highlighted key is that the scaling of pricing is connected to the value delivered. The most commonly suggested scaling mechanism during the interviews was charging per connected machine. This is also due to the alignment with incentives, since charging per machine instead of per site will give both Company V and its customer the incentive to connect more machines and keep them connected. However, there were some considerations brought up regarding this. Some price ceiling or discount for the largest customers might be necessary, alternatively a combination of a site fee and per machine fee, thus creating a decreasing marginal cost for the customers to connect one more machine. "Company V should scale the price per machine, with different costs depending on feature level, since older machines can not offer as much data. After reaching a certain amount some cap could be advantageous" one interview stated on this topic.

There are also some aspects related to the configuration and characteristics of the digital solutions that impact which revenue model is appropriate. One interviewee highlighted that the current value proposition might not be aligned with a model using monthly fees, as the solutions do not deliver value consistently every month, and that it therefore would be better to charge when things get done. Other interviewees brought up that based on their characteristics it would be possible to divide the digital solutions into different levels or packages including different features. Related to this, one of the interviewees further argued that this could be executed efficiently through tick-boxes online where the customer easily can select what it wants to be included in the offering and pay accordingly. However, several other interviewees argued that the configuration should be most dependent on the customer and the relationship between Company V and the customer, including factors such as the customer's pay-back horizon as well as relationship ambition, where e.g. subscription results in a closer relationship. A final aspect brought up by one business developer is whether the solution is general or customized. If many customers want a certain analysis, a subscription revenue model would be good according to the interviewee. If, on the other hand, the analysis or solution is more customized and will not be possible to resell to other customers, the customer requesting it should pay up-front to avoid Company V risking financial loss from it.

When discussing subscription specifically, several considerations were highlighted by the interviewees. Identified benefits included increased incentives for Company V to keep working on upgrading the solutions while getting money for it, while up-front approaches risk resulting in no money to spare for the development of upgrades. The structure of constant cash flow will require Company V to stay close to the customer over time, to ensure that they will continue to be satisfied and stay subscribed. "You have to identify the value for the customer that keeps them coming back", as argued by one regional manager. Some interviewees argue that starting from a low price point is smart to make the customers less questioning to whether they want the solution or not, while still using it and starting to appreciate it, similar to Netflix's model. Then over time more services can be added and thereby the price can be increased. On the other side several interviewees argue for the commitment that follows a higher price and that there is a value in locking customers psychologically through higher prices. Another interviewee noted that digital solutions are not valued as high as other offerings and without this commitment and investment the customers might not be engaged.

Offering some sort of trial was also discussed frequently in the interviews, where several perspectives and concepts were presented. As earlier mentioned, Company V is currently using trials which might be a possible reason for the number of views on the topic. Some interviewees argue that customers do not understand what Company V is offering, and that trials can help with this. These trials are also requested by customers, possibly as part of price negotiations, as they are unsure about the value. One suggestion was to offer the standard digital solutions for free for a limited time to show the value, and then send a priced proposal for the customer to continue the value is understood. Offering something for free was however contested during the interviews, with several interviewees arguing heavily

against it, stating that it is difficult to charge for something that was once offered for free, even in the context of a trial. Building on this, a trial reduces the commitment by the customers, and could reduce the perceived value of the solutions. According to interviewees, with both the customer and the vendor having skin in the game a better and more strategic relationship could be ensured. This would provide Company V with feedback, and making sure that the customer is using the digital solution to gain the value that it is promising.

Another perspective brought up during the interviews was to not approach all current customers at once with the new revenue model or digital solution. One interviewee argued that it is better to split the service and offer multiple levels of solutions to a limited amount of customers at a time. Further, it is of high importance to perform well to the initial customers, one product manager said “Customers talk a lot with each other and rumors matter. [...] If you fail once in a country you can forget it, you have to deliver”. Additionally, some interviewees argued that it makes sense to bundle up the digital solutions with service and support to further force Company V to help the customers make it work.

4.6 External Perspective

The other firms interviewed are in similar overall positions as Company V, i.e. being established traditional B2B firms, and they are also facing similar challenges with the commercialization of digital solutions which was brought up during the interviews. One external interviewee argued that the main challenge stems from a very established way of working, where it is hard to motivate and scale e.g. smaller payments due to a legacy invoicing system making each invoice expensive to administrate. Additionally, new service revenue from digital solutions easily drowns large firms where the hardware and equipment business is big. Further, one of the interviewees highlighted that they are coming from a traditional one-off license culture of selling software, which is mainly based on a cost-coverage approach, and that this makes it difficult to recognize the value of digital solutions which have completely new cost structures. Finally, selling digital solutions as a service implies other appropriate internal metrics than the traditional gross margin. Due to this difference it might be effective to separate the digital business to a separate unit where this can be employed without drowning in the other businesses’ results, which one of the firms had tried.

While not the main focus of the interviews, several of the expert interviewees had experience to share regarding the industries of Company V’s customers. They argued that mining industry customers are resistant or hesitant to changes of revenue models and often prefer to work with traditional CapEx investments. It should be noted however, that these findings were more based on equipment sales, possibly reducing the effect on sales of this within digital solutions. However, digital solutions based on data are expressed to be essential for the industries, since precision and tracking are crucial for such operations. The overall trend towards OpEx instead of CapEx was also mentioned and while that could be seen as clashing with the earlier mentioned

preference of CapEx it can instead be interpreted as the mining industry is slower to change instead of being impossible to change.

One of the interviewees mentioned that they are looking at moving towards subscription and charging based on the number of connected equipment rather than one-off license fees. The main reason for this was argued to be the fact that the digital solutions deliver continuous value to the customer while also offering the possibility to upgrade and improve the solutions over time. By offering the solutions through a subscription model, these continuous payments would be better reflected and it is thus seen as a way to communicate this continuous value creation to the customer. Another interviewee highlighted the advantage of selling digital solutions as a service as providing a trial-like experience to the customers, where customers get access to the product and have the option to opt-out. While this is a new way to offer solutions for these firms, it is perceived by the customers as a significantly smaller risk which is appreciated.

Further, two key forces of change when it comes to new revenue models offering recurring payments were highlighted by one interviewee. The first force is the wish and requests from customers where there is a trend of preferring OpEx over CapEx as mentioned earlier. Based on the structure of recurring revenue models, it is possible to achieve scale and cost efficiency by offering a dynamic that is not driven solely by financial requirements on what to purchase but on the value. The second force is from the vendors who are favored by recurring revenue since it implies an attractive future where revenue will come at a steady stream. In addition to these two forces, some customers are embracing the notion of outsourcing, by purchasing a service, areas that are not in their core competence.

One interviewee argued that it is important to consider the whole customer journey when changing the revenue model, not only focusing on the business model itself and whether it is applicable. They highlighted the necessity to really understand and include how the customer is affected by the change. An example of this is considering how the invoicing system works for the customer. If basing a revenue model on small, recurring payments it is crucial to ensure that the customers are not overwhelmed with administration and costs due to this. This perspective emphasizes that easy-to-buy and easy-to-sell, i.e. the perspective from both the customer and the vendor, should be two factors that are central in the revenue model decision.

The experts have also found that the largest customers are showing resistance to revenue model changes, specifically service based models, for their largest purchases. This is in line with what some other experts discussed regarding the mining industry, as presented above, but it should be highlighted that this is only valid for the largest purchases these customers make. On the other hand, another expert argued that the digital solutions are such a small cost for the customers in relation to expensive equipment that the price is not as relevant in the end once the value is proven. One interviewee discussed this by saying that “The price might have some importance in the first stage but later it is likely not the price that determines whether the customer will stay or not, it is whether the customer experience value”.

Speaking of the value, a very central aspect highlighted by one interviewee is to be able to prove the value of the digital solutions, which can be tricky. This puts emphasis on communication with the customers, where it is crucial to communicate using the customers' words and language to help them understand where the value lies. "Articulate the value proposition to address those needs and what value it can bring", one interviewee said when discussing how to communicate this value. The value that is created should be proven before thinking about the business model innovation since it is at the core of the whole business. Further, digital solutions create value through relationships with customers and other stakeholders and less through simply producing and selling products. Thus, communication and relationships in the network grow more important.

When discussing how companies can achieve results by offering digital services, the experts presented the notion of price and or value not being the only factors relevant. Instead, there is a balance between commitment and satisfaction by the customer, they must be satisfied to continue to commit since by design they have an option to opt-out. "It is the traditional way to demand commitment from the customer. But the risk is that they commit without being satisfied, and thus the opt-out is needed" one interviewee said. This creates the need of consistency, the vendor needs to ensure that the quality of the service is consistently satisfactory, and this could be a major challenge for firms structured for, and experienced, in one-off transactions.

Finally, the interviewees suggested some tips on what are useful mindsets to use when wanting to succeed with offering digital solutions based on their respective experiences. The first learning is to not be afraid of change as an organization. This is important to be able to invest fully into the digital business and to provide the resources needed to make it succeed. The second learning is to work with partners in an open and transparent way without fear of revelation. Since value is increasingly created together with other stakeholders this is a crucial part of being able to develop valuable offerings to bring to the market. A third and final learning was to create an environment where it is possible to experiment with revenue models and business models in isolation of other factors. Experiments like these help the firm itself understand the mechanisms while at the same time educate the customers on the market regarding the new offerings. As the principal researcher put it, "You need to experiment much more, both with revenue models and business models, not just commercial or technical. You should isolate and experiment with different setups". This should however be done in parts, not experimenting with the whole portfolio at once. As an example, some interviewees brought up the possibility of creating a lab where these experiments can be executed to provide insights that these strategic decisions can be based on.

5

Discussion

There are various types of revenue models that can be combined and leveraged in different phases of the process or matched to different types of customers. For example, a freemium model with a free and a paid tier might be combined with a subscription approach in which the payments in the paid tier are of recurring character. Based on a combination of the literature and the empirical findings, the fit of different revenue models for the current position of Company V is discussed to be able to answer the research question.

To answer the first research question, a discussion regarding the relevance of different revenue models for Company V is presented here. Based on the findings from the internal and external interviews, the relevance of revenue models and combinations of revenue models for the firm are discussed according to the structure suggested in section 2.3. The different types of factors are brought up in the following subsections and what input they provide to the revenue model configuration.

Important to note is that Company V is currently structured with one product company based in the home country and several separate sales companies also owned by Company V registered in different countries and continents. These are responsible for sales and support of the equipment the firm offers, and the product company sells the equipment to the sales companies. The digital offers are however currently marketed in the same way, albeit with a different division responsible. The companies responsible for sales and support in the different markets have their own P&L statements, thus setting expectations and giving incentives to adopt strategies that maximize their respective performance, possibly at the cost of the overall business performance.

Another important consideration is the character of the digital solutions in focus. Taking a holistic view of Company V, how the company operates and the structure of its business, clearly indicate that any function of the digital solutions will take a complementary role, with the adapting distinction as discussed in chapter 2. While the digital solutions in isolation could be viewed as replacing ordinary purchases, the overall picture is that of enhancing the equipment sales of Company V, at least in the time frame presented in this thesis and chapter.

5.1 Company V Objectives

As presented in the literature, it is of high importance that the revenue model reflects and matches the overall objectives of the firm and also fits the current strategy and operations. Therefore, the current internal structure and position of Company V as well as the identified objectives of the digital business is discussed here to later be put in relation to the revenue model configuration.

As it was alluded to in the introduction of this chapter, different companies with respective P&L statements could complicate the alignment of the internal objectives of Company V causing issues with designing or implementing new revenue models. Earlier work by the company displayed this struggle, since the internal sales value was set to zero and thus the sales companies were incentivized to give the digital solution away for free if it helped sales of the equipment. Looking at the current structure with still no explicit value put on internal sales of digital solutions, there are still issues with the alignment of objectives. The sales companies have P&L statements regarding their overall business, not digital and equipment separately, but the product company performed a re-organization to bring the digital business into a separate organization with a separate P&L statement.

There could then be a misalignment of incentives between the separate organizations. While some issues still remain in terms of seamless alignment of objectives of the different organizational units in Company V, the focus of revenue models is on the external revenue from the customers and any internal structuring is not relevant for this thesis. However, this incentive structure can be aligned and altered without having to re-structure the organization. E.g. a configuration where the digital solutions are charged per machine would likely incentivize the sales organization to ensure that the machines are all connected with sensors as a part of selling them. This shows that the revenue model configuration can handle, and even solve, such internal incentive issues to work in favor of the internal objectives of Company V.

Further, due to the global reach of some of the customers as well as the organization of product and sales companies, a global strategy and approach of the revenue model is needed. This will achieve consistency across the firm but local adaptations are needed to ensure that the different customer needs and expectations are met. Thus, the revenue model strategy should provide a clear and consistent approach that can be applied on the global scale but still allow for local adaptations when it comes to details, such as what price levels to charge.

In interviews with leaders responsible for the digital business in the product company, it was found that the organization has a clear objective of revenue growth for the digital solutions offered and in development by Company V. Thus, the objective is for the digital business to increase in revenue rather than being profitable right away. Put in relation to the fact that digital businesses often struggle with immediate profitability, which was brought up in the literature, this is considered a healthy and realistic goal. This overarching objective has two main implications for what the revenue models should aim for. Firstly, it will be important to get paid for the digital solutions and not to continue to give them away for free. Secondly, increasing the installed base of the digital solutions will also be crucial to achieving revenue growth. Therefore, a revenue model configuration that allows for strong growth in the installed base while also appropriating revenue from the users is appropriate for achieving the overall objective to grow the digital business in the long term.

An additional, perhaps not as explicitly mentioned, objective is to create and make use of internal value brought from the digital solutions to strengthen the other parts

of the business. As mentioned earlier, data from the digital solutions could be leveraged both by the sales team in terms of customer data to make better sales, as well as providing the R&D department with insights into how the products are used to develop better products overall. While it is hard to quantify the value of this internal use of the data Company V recognizes that a lot can be gained from it, especially looking at the long term. In relation to the previously mentioned objectives, this internal use would be highly related to the aim of a large installed base as it would enable a larger data quantity and thus likely also higher quality. Therefore, the internal value perspective further underlines the importance of the revenue model to enforce user acquisitions rather than instant profitability.

Being OEM agnostic was also brought up as a long term objective by Company V, to build on the primary goal of revenue growth. In some ways, achieving the revenue growth is viewed as depending on the ability to include machines manufactured and sold by other companies on the customers' sites, such as competitors or other suppliers who are not directly competing with Company V. Working towards the objective of being OEM agnostic requires Company V to consider complications to their business model, since the company no longer would be able to control the entire product stack. This can be derived into two different scenarios, either having sensors already installed on the machines that can be connected to the Company V digital solutions, or new sensors need to be developed and installed to connect the machines. These scenarios create a number of considerations for Company V, and focusing on the revenue model it can be described as two levels of effort required from Company V to connect the new machines. If current sensors are already installed and can be connected it would be possible to utilize similar revenue models to those of high digital maturity customers, i.e. selling and enabling digital solutions with reduced local visits. Thus a more hands off approach which results in a lower marginal cost. Developing and installing new types of sensors increases the marginal cost for Company V substantially, requiring the revenue model design to incorporate this increased effort and cost. While approaching these long term issues is slightly out of the scope of this thesis, they constitute important considerations for Company V in its further work on digital solutions.

As discussed, embracing OEM agnostic solutions requires a specific strategic approach to the role of digital solutions in Company V. Selling equipment is and will likely always be at the core of Company V's business, which means that the digital solutions must position themselves in relation to it. The view on whether the digital business is, and will be, solely complementary or a core part of the business differed among the Company V interviewees as noted. The mindset and intention regarding this will of course impact what role in terms of revenue model the digital solutions should take. If the digital solutions aim to solely support the existing business of selling equipment and machines, i.e. an adapting service as earlier defined, it might be sufficient to provide it for a fee that is sustainable for the business without maximizing the margin. It is possible to accept a lower margin since the profit driver is expected to be the machines and thus the priority is to enhance the value of them either by improving their performance or viewing them as a requirement to gain access to the digital solutions of Company V. On the other hand, if the aim is to

make the digital solutions a more stand alone part of the business the revenue model must reflect this to capture more of the value and to make the customers perceive it in that way. Therefore, whether the aim for the digital solutions is to support the equipment or to work as stand-alone value drivers, it is important that the offerings are formed in a way that gives the digital business the attention and resources it needs to grow in the long term.

Combining the discussions of the role of digital solutions and the objective of becoming OEM agnostic, a key consideration is how becoming OEM agnostic would impact the digital solutions offer. If the target of the digital solutions is to become a separate and high performing business unit, the objective to include other machines is reasonable since it will expand the scope and thus possibly allow more value to be captured. However, if the goal instead is to be and remain complementary to the machine sales, including competitors' machines will risk to reducing the effectiveness of the value added by the complementary digital solutions. As discussed regarding the reversed razor and blades revenue model, a digital solution can improve the offer of the expensive core product but it only does so if that digital solution can not be used with a competitor's core product. Thus, the objective of an OEM agnostic digital solution should only be used if the overall goal is achieving a standalone digital solutions business. However, selected partners from companies that offer products that are complementary and not competing to Company V can still be included.

5.2 Fit to the Digital Solution

The digital solutions themselves both enable new opportunities and bring with them some challenges. These opportunities need to be considered in the design of the revenue models to ensure that they are properly understood, and the challenges need to be noted to not to take too many risks.

A natural place to start is with the value that is created from digital solutions. All digital solutions are based on the customer getting access to equipment data collected by sensors which are then displayed and visualized in different ways depending on the solution. The value of this, as articulated by Company V, is that the customers get to see the data and get the possibility to make improvements based on it that can make them more efficient in their operations. While improvements in themselves are valuable for the customers there is no guarantee that they will come as a result of purchasing the solution. Additionally, it is up to the customer to realize and implement the actual improvements, which historically is proven to be challenging to make happen, which further might reduce the amount of value that is created through the current structure of the digital solutions. Therefore, there are current challenges in how customers appropriate or understand the value delivered by digital solutions from Company V, which have clear implications for revenue models that emphasizes or require an understanding of customer value.

Due to the characteristics of the digital solutions it is possible to meter and charge for the usage of some of them, as brought up in the findings. This enables pay-

per-use types of models which also bring new opportunities to price the product even beyond the digital business, i.e. to charge for the hardware equipment in new ways. However, simply because it is possible to charge in new ways it might not be appropriate to do so per se. It is important that the valuable part of the offering is reflected in the charging and that the customers appreciate it for it to be successful.

Another enabler from the digital solutions is the unlocking of new ways to communicate with the customer and receive feedback if employed efficiently. Since most digital solutions center around customer data it will automatically provide Company V with some new insights into the customers' operations through this data. The relationship might become closer and more transparent due to this, where it gets easier for Company V to identify the value for the customer and help deliver it. New revenue models primarily enable this in two ways. First, this is possible if the offering takes an active approach, i.e. if it does not just rely on a one-time payment where the customer after that is left to itself. Further, the revenue model can also be built with an approach where the price is set based on e.g. usage levels. Since such a revenue model also requires an active foundation, the communication between the vendor and customer will automatically be closer.

Further, it is easier to start and stop the access to digital solutions compared to selling and returning hardware equipment. This enables a faster reaction time from both the vendor's side and the customer's, which opens opportunities for new revenue models that require the ability to quickly change the offer, pricing or solution. These changes can be made from both Company V's and customer's side, and quick adaptations such as this could be clearly linked with the communication advantages discussed above.

An obstacle regarding the success of digital solutions is the fact that the digital solutions from Company V are dependent on the customers' connectivity on site. This challenge imposes a risk for Company V in offering full service solutions where access to the solution would be guaranteed, since it would depend partly on the customer doing its part to ensure connectivity. Due to this risk of failed connectivity, it can also be difficult to form the offering based on a data flow from the customer, e.g. using pay-per-use, if that data flow is at risk of occasionally failing. Further, as Company V inherently is not a software firm it is not yet confident in handling continuous support operations of that type to the extent that might be necessary to keep the digital solutions at full availability. On the other hand, providing continuous support and monitoring connectivity will be essential to offering digital solutions even if not through a full service offer, as it is needed to ensure that the solutions are healthy and used in an effective way, as highlighted in the findings. And taking that perspective, offering a full solution where service and support are included, i.e. granting availability and access to the digital solution, can be efficient since that would both force and enable Company V to keep the digital solutions going at the customers' sites.

Across the currently offered digital solutions there are some differences that need to be taken into account since the solutions and thus the customer use cases differ.

Therefore, what revenue model is most appropriate could differ between different types of digital solutions. For example the portal provides the customer with insight, and thus value, on a continuous basis while reports or benchmarks are perceived to deliver value to the customer at a more specific, sometimes single, point in time. It would also be possible to track the usage of an interactive solution such as the portal as discussed before, while it would be difficult to do the same for the benchmarks. As mentioned in the interviews, it is possible to divide the solutions into basic versions and offer add-ons for the more premium features. To implement this, the revenue model must allow this division in an effective way for the relevant solutions.

The different solutions also differ in terms of marginal cost as has been seen earlier. However, as this cost is mostly centered around training and support, where the drivers of it are both how difficult the solution is to understand and implement as well as how digitally mature the customer, i.e. how much support is actually needed from Company V. Thus, Company V's marginal cost of a digital solution will be high if both the solution requires big changes for the customer and Company V needs to help facilitate these changes. This highlights a need to segment the offer and the customers, to be able to leverage the low marginal costs of some cases while ensuring a higher marginal through revenue when needed. Further, a greater demand for training and support is not only a burden of costs, but it also yields an opportunity for Company V to be more involved in the implementation of the solution which both strengthens the relationship to the customer and is an opportunity to gain extra revenue if charged for.

Building on the fact that Company V is not an established software firm, it is not used to charging with new revenue models that are enabled through digital solutions. This adds the challenge of internally making it work as a part of the existing business, as it might differ on both what the offering inherently includes as well as the way it is structured according to the revenue model configuration, a challenge recognized in both internal and external interviews. Company V will continue to sell equipment and machines as its main business and the digital solution offerings, regardless of whether they are considered core products or not, must therefore take this into consideration when creating the fit with the existing business. Thus, while new solutions come with many new opportunities for a firm like Company V, it is essential to not go too far away from the core business and to keep having the customer value in mind to stay focused with the approach.

5.3 Market Factors for Company V

The specific market and industry of Company V imply opportunities and challenges that should be met with the revenue model configuration in order to properly succeed with the digital solutions.

In the interviews the need for local adaptations of any solution was highlighted when discussing digital solutions. Customized dashboards were mentioned as an example of these adaptations. Building on this, fitting the offering to the customer is of

utmost importance for any solution, no matter if it is called local adaptations, a global support team or customer experience experts. Since the current machinery sales use local adaptations of the price or pricing structure, the question is whether this also should be the case for selling digital solutions. With the exception of massive global corporation deals, the need for this local pricing approach was not expressed to be profound, neither from Company V nor in the literature. There are however differences in the WTP between customers, creating a clear need for segmentation or scaling of pricing in the revenue models. But these solutions are, in exception of e.g. local training, delivered on a global level and can thus be priced or segmented as such.

As the customers of Company V differ, there is a need and possibility to segment the market on size, digital maturity and industry. Segmenting relates to the revenue model design in that it is important to offer revenue models that suit the different preferences and circumstances of the market as much as possible. Through approaching the market in segments, these differences can be effectively met, given that the segments are effectively identified. The customers of Company V differ in their location, size, digital maturity, and what industry they operate in, to name some of the most crucial differences. The segmenting factors should be factors that determine the customers' behavior towards the offerings, which in this case are identified in terms of industry, size, and digital maturity. As mentioned earlier, the construction and mining customers differ in their use case of the digital solutions where construction customers look for equipment availability and mining customers look for equipment productivity. The size of the customer's operations has been proven to be related to the customer's need of outside assistance, where some larger sites have their own operations team while smaller sites lack of such resources. Finally, the digital maturity of the customer determines how much support is needed if selling a digital solution to it, and also how eager the customer likely is to engage in these digital solutions. By segmenting on factors such as these Company V will be able to offer the right digital solution, with the right revenue model, to the right customer.

Connecting the revenue model to the size of the customer is a success factor since the size affects key factors such as WTP for the entire digital solution. It would not be possible to charge a small customer the same price as a large, since the vendor is either not able to capture a reasonable level from the large customer, by charging too little, or not being able to capture any value at all from the small customer, by charging too much and losing the sale. By scaling the pricing according to the size of the customer Company V can design the value capture to suit most customers, and then scale accordingly. While some work is needed to include scaling in the revenue model design, it will allow for increased value capture. Since the digital solutions of Company V currently are based on data from the machines, measuring size by connected machines is the obvious choice. It is reasonable from the customers' perspective, increasing pricing when the digital solutions are applied to more machines, but it also could provide an incentive for the local teams to connect more machines and thus provide more value for both the customer and Company V. It was discussed in the interviews that some startup-fee or reduced

cost for the largest customers could be necessary, a view from the regional offices, and both of these approaches could be incorporated in the global scaling of the revenue model.

Further, how customers view or accept new revenue models is of high relevance for Company V. The customers in both industries are very CapEx heavy, thus putting a high emphasis on such costs. A worry was found that customers may not be used to buying products or solutions with revenue models that instead use an OpEx model which could create resistance in the sales process. On the other hand many industries, including those where customers of Company V operate, are shifting the focus to OpEx as mentioned before. This could instead create the sentiment that any revenue model that does not focus on OpEx is no longer desirable, thus requiring Company V to adopt new revenue models quickly. The balance between offering familiar revenue models to slow-moving customers and adapting to faster, or new, customers are also influenced by the competitive landscape. Since competitors and suppliers of other products to the same customers are shifting to OpEx revenue models, it creates a need for Company V to follow suit. However, as found in the expert interviews, the price of complementary digital solutions is generally so small that the focus is on value creation rather than the price structure, thus likely making the discussion of preference of CapEx obsolete.

It should also be noted that customers in different industries have different priorities and possibly are looking at different values from the same digital solution and various types of relationships with the vendors. Since the current digital solutions offered likely fit all current industries of Company V, what the current value they are able to bring or help produce will differ depending on the customer which in turn affects which revenue model is best suited. For example, differences in priorities have been noted where the construction industry puts focus on availability while the mining industry instead focuses on output efficiency. The revenue model should aim at bringing forward the highest prioritized use case and value for each respective customer, especially important since the expert interviews argued that these industries could resist revenue model changes. Further, the relationship between Company V and the customer differs among the customers and this relationship is clearly linked to the design of the revenue model. As noted, some revenue models require a much closer relationship with customers than others, and digital solutions can offer, facilitate, or disrupt this. In reverse, revenue models can in some sense enforce close relationships with customers. Therefore, what priorities and what relationship the customer has and wants will impact what revenue model is appropriate and should thus be considered in the formation of it.

Further, a crucial factor when it comes to evoking the customers' interest in digital solutions is to be able to prove and communicate the value of them. While this varies with the customer's digital maturity earlier discussed, it is evident that the customers of Company V overall have troubles with understanding and grasping the value that can be created with digital solutions before implementing it. While mining customers are proven to be quite reluctant to change, the literature also suggests that the mining industry is approaching innovations mainly through their equipment

manufacturers that innovate for them. This further emphasizes the importance of fostering a capability in Company V to communicate the value of the solutions, since it determines whether the firm can capture the value from the customers or not. When it comes to communicating the value of digital solutions, the most critical issue is to get through the customers' initial doubt that multiple interviewees have witnessed. Once the value has been proven for the customers they have shown to be willing to commit, with some lock-in effects in favor of the vendor. Therefore, Company V will have to invest to initially succeed, since the customers would rather be the second to embrace them, as noted in literature. However, once the value is communicated to the customer the vendor gets to enjoy first-mover advantages since the customer gets locked-in with the specific provider.

However, when it comes to forming the incentive structure a balance is needed, which was discussed in both the internal and the external interviews. For example, giving away the digital solutions for free is a way to get a large volume of users of the solution, since the customers then can test it without any financial risk. This is very effective in overcoming the initial barrier of customers who are doubting or not understanding the value. But as discussed before, this might also lead to Company V investing time and resources on customers that are not really committed which can be disadvantageous in the longer term. It would be optimal to be able to effectively reach out to those customers who are sufficiently interested and committed to digital solutions overall, and then ensure that they go with the specific solutions of Company V. It is also of high importance to ensure that when the digital solutions are delivered to the customers, it is properly done so that the value is shown and the customer is satisfied and will return. This is emphasized in the literature where a successful impression on the customer is key for models built on proving the value, e.g. freemium and trial. Therefore, it is not beneficial to target lots of customers at once if it means that the solutions can not be showcased effectively due to limits of resources and focus. Thus, a balance between lure and requirement of commitment is needed to be achieved by the revenue model configuration.

6

Implications

In this chapter the implications of the discussion will be presented, where what the factors and considerations discussed in chapter 5 actually implies for a firm like Company V will be in focus. This chapter will take the time frame both in the near term looking at the current position, as defined as within 0-3 years, and more long term looking more broadly at the future outlook for the years after that.

6.1 Revenue Model Design

The three areas previously discussed in chapter 5 all contribute to what revenue model configuration is relevant and appropriate for Company V. Key implications of all factors are here synthesized and put in direct relation to the choice of revenue model configuration.

Company V needs to start charging for its digital solutions, whether considered strategic or supporting. While there have been different opinions on the value and role of digital solutions for both customers and the overall business of Company V, there is no alternative other than to charge for the digital solutions that the company offers, or plans to offer. Charging is in line with the strategic goals of the digital business unit, revenue growth, and what the literature review recommended for manufacturing firms in a digitalization journey. Charging for the solutions will emphasize their value and create internal incentives for continued development, two aspects that are important regardless of strategy. Building on this, the cost of the digital solutions for the customer is, as noted, orders of magnitudes smaller than its other costs, which can allow Company V to price more freely for the digital solutions without affecting sales. Instead, it is about communicating the value, and charging a part of this value, that will be key.

The subscription model should be leveraged to form the overall offers of the digital solutions. As discussed, several revenue models can be combined to form the offer, and the subscription model should be a key aspect of any model that Company V or companies facing similar challenges employ. This is due to the benefits earlier discussed that are related to charging OpEx in an active way, in contrast to the traditional up-front payment model that is both passive and CapEx focused, something that the external interviewees also have noted. The subscription model should be applied for all digital solution customers of Company V, even though some customers might be hesitant to switch to an OpEx model. This is also appropriate with regards to the digital solutions being easy to enable and disable, as brought up in the discussion. Monthly fees are advantageous, if possible, to achieve a high degree of flexibility, if not possible at least quarterly should be implemented. A unified offer will reduce pressure on local sales offices to make exceptions, it will

allow for other revenue models that build on the subscription model to be used globally, and it will simplify the messaging from Company V. Thus, the cost or risk of a non-unified offer is likely greater than the cost of convincing customers to purchase using a subscription model. The subscription model further brings the advantage of making the payments active and ongoing which will benefit Company V in its customer understanding and communication, as discussed before. The main risk with subscriptions is the financial exposure related to less predictable revenue streams. However, since the digital business unit is part of the larger organization of Company V the financial business risk is not as severe. Finally, it will allow Company V to structure internally with subscriptions in mind, creating incentives to constantly improve the solutions and to connect more customer machines.

Customers should be segmented according to industry, size and digital maturity. This segmenting is effective since these factors are identified to determine how the customer views digital solutions, what value those can bring and thus what resources it is willing to commit. In some cases the same digital solution can be used to bring different values to different industries, and the revenue model needs to be adopted to embrace the change of perceived value created. Digital maturity has been discussed at length in this thesis, but we emphasize that it can be used to also segment customers from different regions, thus still allowing a global revenue model without local adaptations. Some local aspects of the training or adaptation could be culturally dependent, but the digital solutions are global by nature and should be treated as such by the revenue models.

The digital solutions should be structured in tiers that are offered to the customers. The tiered model fits the digital solutions since a standard offer can be constructed to which more premium features can be added to create the tiers, and the nature of digital solutions allows for quick movement between tiers for customers. Additionally, the web portal, which most digital solutions are centered around, is currently structured in a standard and a premium version, providing good circumstances for offering it in tiers. This would benefit Company V since it allows for the different customer segments to simultaneously find a suitable level of the offer that matches their current demand, without losing too much focus. It is however relevant to emphasize the importance of creating tiers that all are charged for, i.e. not applying the freemium model by making some tier free. Tiers that are charged for enables an effective segmenting of the portfolio, while the freemium model also brings some risks that make it unbeneficial. The tiers should be based on offering different levels of functionality of the digital solutions to the customers, where more expensive tiers provide extended functionality and thus more value. An exemplified structure of the tiered design can be seen in Figure 6.1 below, but it is important to ensure that the tiers are configured according to what the customers value to make them efficient. However, specific solutions such as APIs can also be offered separately as add-ons, if customers are interested in e.g. the standard data version but want it in their own systems.

The payments should be scaled per connected machine to achieve an effective pricing structure. In combination with tiers, scaling the pricing based

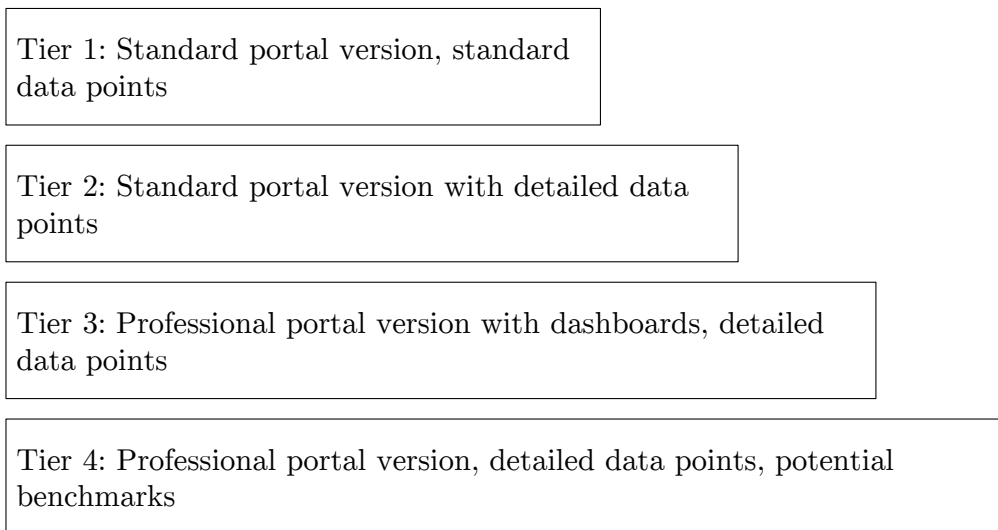


Figure 6.1: Example of a tiered revenue model for Company V's digital solutions

on the number of connected machines will allow for an effectively structured revenue model. The model will then capture additional value both from more features and larger clients, something addressed by one of the external experts as well. This type of price structure, in contrast to offering a flat rate, should build on the subscription model to allow for changes in demand, features or size to be reflected in the next billing period. By charging per machine the local sales offices, that have P&L statements as discussed, will gain an incentive to connect as many machines as possible at customers, thus aligning the incentives with both the customer and the global brand of Company V.

Free trials should be avoided to communicate that the solutions are valuable and to not risk customers being uncommitted. While the digital solutions offered by Company V could in some sense be viewed as experience goods, utilizing the trial revenue model is not a recommended option. Rather, the disadvantages associated with it, primarily the risk of customers not committing and understanding the possible value, is likely much larger than the opportunities. It was also found that customers do not need to experience the value themselves, instead Company V needs to be able to prove that the digital solutions provide what is stated using proof from earlier sales. Thus, the three months that are currently, in some cases, offered for free to the customers should no longer be the standard approach since it contributes to confusion regarding the value of the digital solutions. However, if it turns out to be very challenging for Company V to prove the value of the new solutions to the initial customer without offering any form of trial, a close relationship, with trial-like pricing, can be leveraged as a tool to communicate the value to future sales. But this should not be regarded as offering a free trial but rather to collaborate closely with the initial customer to communicate the value. In this case, it could be advantageous to highlight that the customer is paying with being first and giving Company V access to its data, thus still putting a value on the digital solutions.

Freemium is facing similar issues as trial and requires low costs, clear communication to possible work. Freemium is inherently quite similar to trial revenue models, with the distinct difference that the offer is clearly segmented into a basic tier that is provided for free. This can allow for communication about what possible values the customers are missing out on by not upgrading, but the issues of commitment still persist. For Company V to be able to successfully employ the freemium model, it is crucial to keep the costs low, the value of the other levels must be very visible, and the customer must be sufficiently attracted to the other levels which are charged for. Thus, it is important to design the free level in a way where not too much is given away. If all these criteria are fulfilled, it might work to offer a very basic level of the digital solutions for free to enable a fast user acquisition, but in the long term it is more suitable to charge for all levels to avoid the risks.

Company V should continue to bundle the sensors with the machines for free It is possible to describe the revenue model as a variant on the razor and blades model, cheap sensors that open the opportunity for Company V to charge high margins on the digital services. With this perspective, the sensors and the digital solutions can be seen as two different products, or at least two distinct parts of the product. The customer would still be responsible for the sensors after receiving them bundled with the equipment purchase, and it is essential that the sensors do not provide data to any other digital solution provider for free. As discussed, the bundling model approach works well to ensure a growing installed base of sensors that the customers otherwise might not be willing to pay for. It should be noted that bundling the sensors with the equipment is not the same as offering a trial, instead this offers two key values for Company V. It not only offers data back to the internal organization about usage, but it also significantly reduces the hurdle for any customer to purchase digital solutions from the firm. Therefore, a razor and blades model, combined with the bundling of sensors, offers an increased installed base, new growth opportunities and is a sensible approach.

6.2 Current Position

When taking the time perspective of 0-3 years, which has been the main focus of this thesis, several implications for Company V have been identified.

There is a need to better define the value that digital solutions create for customers. Looking at what value actually is created for the customers by the digital solutions is challenging due to several aspects. Company V has mostly not charged for the digital solutions, reducing the value that the customers perceive radically. It also has some work to do internally to define the value that the digital solutions create for the customers. When designing the revenue models, it is essential to understand the customer value, and Company V should therefore improve its knowledge and capability to define this. Further, while it is naturally important to understand the values that the current solutions bring, it should be prioritized to understand the values that can be created through new business models or with new digital solutions. This is due to the identified challenge in charging for solutions

that previously have been given away for free, where it likely would be easier for Company V to charge for new offerings from the start.

Company V should experiment with new revenue models in close connection to its customers. External interviews highlighted the value of experimenting, arguing that it is impossible to have complete knowledge before starting. Company V, with its work in digital product development, has the ability to establish close customer relationships during development, possibly allowing also including discussion or experiments with the revenue model. This also ties in with the potential problem of current solutions not offering enough value to warrant new revenue models earlier discussed, since charging for the same solution that earlier was offered for free will be difficult. If this turns out to be the case, new solutions with a new value proposition will be key for the new revenue model development. Thus an implication for Company V is to work through experiments to understand the value of different designs of revenue models.

While the customers should be segmented based on size and digital maturity, no segments should be ignored. Segmentation in terms of the number of machines as well as digital maturity enables approaching the different customers with suitable offerings. As discussed earlier, the difficulty level of the digital solution and the digital maturity of the customers are the key drivers of costs and perhaps also eagerness. The more mature customers might have their own pre-existing understanding of digital solutions and resources to implement them effectively themselves, while digitally immature customers will require more from Company V. However, this does not mean that the digitally immature segment should be ignored, not even initially, as it shows a lot of potential and helps with expanding the user base. Instead, Company V should be prepared to meet this segment with more support and training offered together with the digital solution, e.g. getting the web portal running and showing the customers how to extract and use the insights from it.

Efficient internet sales with a global revenue model should be combined with local adaptations regarding training and support. As Company V currently is structured as a global product company with local sales organizations, this must be considered when implementing these offerings in the short or near term as it is difficult to alter quickly. While the revenue model for the digital solution should be global, these local offices will play a crucial role in ensuring training and support to the customers with lower digital maturity. However, digital solutions based on software and sensors that the customers already possess inherently enables remote sales over the internet, where the customer can get it for itself swiftly. This is a very convenient way to sell for both the customer and the vendor, which can be seen implemented by several large software firms. This makes it easier to quickly increase or decrease the offering and make adjustments. It would therefore be beneficial to leverage the internet when delivering the digital solution on a global scale. However, this global, internet-based revenue model should be combined with local revenue models on training and customization since there will still be customers wanting or needing such support where sales and solution experts will be valuable.

Company V should recognize the value of the local sales offices for digital solutions and corresponding revenue models. Company V has an extensive network of local offices with close relationships with the customers which is a capability that should not be disregarded in the digital business. Therefore, the responsibility of training and local configurations of the digital solutions should be put on the local offices, as they are experts on the customer, which should be made available for the customer if requested. However, this should not interfere with the global revenue model approach and it should be avoided to bundle the solution with the training. It is important to keep the distinction between the global model and the local training and configurations. Thus, there are advantages both in enabling direct sales over the internet and in leveraging the local sales offices. Company V should therefore offer two possibilities for customers interested in acquiring digital solutions, directly over the internet or with more support through sales offices, which will likely match the segmentation earlier touched upon.

The digital solutions should currently be viewed as complementary to the machines. Building on the internal structure comments above, there was significant discussion regarding the purpose of the digital business of Company V. While the official target was identified as revenue growth, some arguments against that were put forward. The goals of every business unit must coincide with the strategy of the overall business of Company V, thus the holistic view about the type of digital solutions Company V offers was presented in chapter 5. Building on the view that the solutions, in their current role for Company V, will be complementary adapting services is the question of what financial goals this implicates for the digital business unit. As discussed, it is of utmost importance to charge for the services offered, but the short term goal of the revenue models should be to sustain new development of services, thus increasing the overall value proposition of Company V's capital sales. The value of a machine increases if there are additional services available, despite those not being free. There are several implications of this strategic guidance, including a focus for the revenue models to grow in reach and value capabilities for Company V machines and sensors, with less focus on other OEMs since, as discussed earlier, competitors should be locked out of the digital solution to increase the value of Company V machines. Expanding the business outside of this sustaining role, and thus also a transition towards OEM agnostic solutions, can be possible in a longer time span and will be further discussed later in this chapter.

To start charging for digital solutions might have effects on the overall value capture of the firm, making it extra important to communicate the value of the solutions to the customers. An argument against charging for digital solutions that have been offered for free with the machines is that it will hurt the value capture of the machine sales, which is seen as the core of Company V, especially if customers expect to get the digital solutions for free when considering the machine purchase. However, this will not necessarily be the case, as evident by several key points. It has been recognized in this thesis that customers are currently not realizing and putting value into the digital solutions, in part caused by Company V offering the solutions for free. Thus, since the customers do not value the solutions and Company V is not charging for them, there is no actual risk of reduction in

value capture by seizing to offer the digital solutions for free. However, while it is the overall case that the solutions are not valued, some customers are happy with getting solutions for free and will thus likely resist pricing changes. To approach this challenge, it is important to ensure that the offerings that are charged for are perceived by the customers as different and value adding, compared to what was previously given to them for free. This can be done either through emphasizing the new business model, getting the customers to understand and use the value created, or by offering new solutions with a new value. Through these offerings that are associated with new value for the customers, Company V will be able to capture new value while the customers gain additional value from the new offerings. Additionally, starting to charge for solutions will further emphasize the value that digital solutions offer to the customers. The improved values that the new digital solutions or business models offer to customers, combined with the aforementioned complementary role of the digital solutions in Company V, can instead of reducing, as previously discussed, actually increase the value capture for the machine sales. This is caused by the complementary role of services increasing the value of the machines, since the digital solutions offer enhanced value of the machines that Company V, by aiming to sustain the business rather than maximize profits, is capturing only a small part of. This entails that the customer is receiving much more value from the digital solutions than what they would be paying, increasing the overall value of the complete offer by Company V. Thus, the risk of losing value capture is offset by the potential in new business models, digital solutions and the actual role of the digital solutions in Company V.

6.3 Future Outlook

Considerations are also possible to identify in a longer time perspective. Implications in this section are in the range of 3-6 years and while these are more theoretical by nature, they suggest potential in the future of revenue models connected to new digital solutions.

As the installed base grows, benchmarks will become a relevant future offering and enable other revenue models. As the digital solutions offered by Company V collect and use data, multiple opportunities regarding potential uses of this data arise in the future. One example is the potential to produce benchmarks, which have been requested by the customers. When the user base is sufficiently large and thus more data can be collected from multiple sources, Company V is in a great position to combine it and offer it to the customers as status reports regarding where they perform in relation to their competitors. As this already is requested by the customer, the value of it is clearer and easier to communicate, which opens up for new revenue models to be leveraged. Due to this eagerness, there is no need to create too much incentive for the customers to try, e.g. through trial or freemium. These revenue models would thus not be needed and Company V could instead directly charge a fee based on how valuable the data in the benchmark report is and how many reports the customer wants. A possible way to do this would be to charge for the improvements a customer makes that are related to the data provided.

Potentials like this imply that Company V should continue to discuss the value of digital solutions with its customers and to experiment further and more freely with new revenue models.

A full service offering might be possible but needs to consider the customers' connectivity. Building on the potential value that improved services based on sensors can deliver, one option is to only focus on what the customer gain value from. In other words, offering a service where aspects such as sensors and connectivity are included but not what the charging is focused on, but instead the digital solution and the guarantee that it will be delivered. Such full service offers, almost a black box that delivers value for the customer, are more common in other industries but the possibilities are the same for Company V. It would allow a higher focus on the value of the services and allow Company V to capture even more value. However, connectivity is a real challenge in many of the customer sites, as most sites currently rely on customer network solutions. One alternative to overcome this is to exclude the network operations from the full service contract. For customers with high digital maturity, this still offers value from Company V with ensuring sensor operation and updating old sensors, to name a few examples. For customers with lower digital maturity, another option could be for Company V to co-operate with a connectivity partner, installing and maintaining network solutions for the customer together with it. External interviews highlighted the need to co-operate with partners, and this is one example of what possibilities such co-operations would allow.

The benefits of having connected customers might motivate providing connectivity free of charge. As the identified internal value is considered high for Company V, there are benefits in ensuring that the customers are able to use the digital solutions. A connected customer implies a customer who is able to start purchasing and using the digital solutions and thus increase the user base, of which we have discussed benefits from before. With these benefits in mind, a future approach to this could be to offer the connectivity free of charge together with the partner. This would create a structure similar to razor and blades where the customer is enjoying a cheap product, i.e. the connectivity, while still being charged for the digital solutions. In that way, the revenue from the digital solutions can be viewed as subsidizing the connectivity for the customers needing it. However, this requires that the digital solutions are properly charged for and that the connectivity offer would not impose too high costs for Company V through the co-operation earlier discussed.

New customers can be reached if expanding the digital solutions' scope. Moving further than presenting data from Company V equipment to the operators of such equipment could allow for the business to grow from the complementary and sustaining role to a more complete business unit of the company. These new segments could either be built to better serve the current customers by adding support for other OEMs' equipment, including competitors, that are used in the customers' sites, allowing the digital solutions to become more of a full operations platform for the customer. The other possible route is to use the same data in new ways. The

value of data from the machines is evident by the discussions on internal value for Company V and similar value could be extracted from other companies, such as suppliers to Company V looking to understand how their supplied components are used or other suppliers to Company V customers looking to integrate their digital solutions. However, there is a major concern of ownership of the data, where the current contracts do not allow for Company V to capitalize on their data to other customers. Thus, there is still work to be done in the contracts, but primarily it is about how to communicate and deliver value. If it is seen as delivering value instead of data to the customers, it is likely that they will be more open to these arrangements in the future, allowing Company V to expand or build new revenue models.

7

Conclusion

There is clear potential for implementing new revenue models in a traditional manufacturing firm that is embracing digital solutions, and it is likely necessary to do so. Company V has increased its investment into digital solutions, including moving it to a separate business unit but has not yet succeeded in capturing the value created, a problem found in many firms facing similar situations. This thesis aims to research, develop and understand revenue models, a designation aimed to include the two interlinked concepts of how to charge and how to sell in the business model and the implications of such changes.

Value for digital solutions can be hard to define, and thus historically it has been hard to make consistent revenue from it. This thesis highlights the importance of charging for digital solutions, with the main reasons to ensure continuous interest for the business internally, get proper commitment from customers, and emphasize that the solutions have value. However, it is also found that the initial objective for any firm in this journey should not be to revolutionize its business immediately, but rather initially see it as complementary to the core business to allow it to grow in capabilities and knowledge of customer value.

In this thesis, eight revenue models were identified in literature that were put into the context of the heavy equipment OEM firm Company V to investigate which ways are appropriate to charge through. Based on interviews, the factors impacting the revenue model configuration were discussed and a concept for revenue model design for Company V was presented. This indicated that manufacturing firms in similar situations as Company V would benefit from implementing a subscription model offering different tiers where the price is scaled per machine.

Core implications of this are that Company V should embrace a global approach for the revenue model while utilizing the highly knowledgeable, and thus valuable, local sales offices for local solution adaptations which are identified as highly valuable. Experiments with different revenue model and digital solution combinations are recommended since it is impossible to have perfect knowledge initially. Looking at future possibilities, an increased installed base would imply more and better data to base new offerings on. This could possibly be leveraged to new types of customers in the ecosystem.

This thesis thus contributes to the understanding of the combination or development of new revenue models and digitalization for manufacturing firms. Further research has the potential to build on the work of this thesis and study the transition of digital solutions in manufacturing firms from initial experimentation, early complementary roles to an established and profitable business.

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A

Appendix: Interview Template

Digital solutions

- Briefly, what digital solutions are you offering today?
 - Do you view these as necessary to sell ('hygiene factors') or as value adding, possibly allowing you to charge more?
- How are you planning on offering digital solutions?
- What type of digital solutions are to be developed?
- Which are expected to be the key profit drivers in the future? Which are less expected to be it?
- In your perspective, what are the key objectives of offering the digital solutions? E.g. user acquisition, profitability, cover costs
- How to categorize them? / What sort of groups?
- What use cases are in focus?
- What digital solutions are requested?

Attributes of the current and future digital solutions

- Does the customer need to experience the goods to understand its value?
- Would you say that there are network effects, as in the more customers joining the better it is for everyone?
- Is it possible to differentiate between different tiers?
- Are different segments of customers requesting different solutions, or levels of solutions? Do they differ much in size?
- Are there lock-in effects? Where / how are they?
- Do you think the usage of digital solutions for a customer will be stable, or rather erratic / cyclic?
- What would you say the cost is for adding an additional customer? Would there be startup costs or sales costs? Such as training, dashboard setups, custom solutions?

Customer perspective

- What current values do you see digital solutions bringing to the customer?
 - How about new revenue models?
- What are the customers looking for when it comes to digital solutions?
- Have you noticed a trend in more digital acceptance?
- How are they using current digital solutions?
- How willingly would they embrace new digital solutions?
- How does that differ across customer segments?
- Would training help with the adaption?
- How much adaptation would be needed for digital solutions?
- Do you think the buying process is different for digital solutions?
- Different cost center, influencer, user etc Do you know if the customers purchase from other suppliers using other revenue models?
- E.g. are any other purchases subscription based?
- What do you think are important aspects for the customer when it comes to the revenue model used on the solutions?

Company V perspective

- What do you view as the biggest internal issues of new revenue models?
- What do you view as the biggest internal struggles of capturing value in digital solutions?
- How do you think Company V should explore new revenue models for digital solutions?
 - How to develop?
 - How to communicate internally & externally?
 - How to sell?
- Do you think that digital solutions or new revenue models open up new areas of business? E.g. collaboration with partners etc.
- What value do you think Company V gains with the digital products? (Data

on usage, able to sell data / insights to suppliers, able to deliver services such as predictive maintenance)

- How do you think this value should be captured internally?

Revenue models

- What revenue models have been deployed before?
 - For all products?
 - Specifically for digital?
- Based on your current revenue model / how to charge for the digital solutions now, what do you view as the biggest issues that that model causes?
- Are some revenues more appropriate for specific types of products? How is that matching?
- What do you view as the biggest opportunities in new revenue models?
- What do you view as the biggest threats in new revenue models?
 - Customer acceptance issues?
 - Any operational issues?
- How should you scale the price depending on the customer's size? Per site, user, machine, sensor
- Do your current or potential customers express interests in any revenue models? Preferences?
- Do you see a trend in the industry when it comes to new revenue models?
- Do different segments of customers have different views on revenue models?
- Or do you see possibilities to segment using revenue models?
- Ask about some revenue models specifically?
- How do you think XX (revenue model) would be received? What would be the challenges?

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