

Servicizing in Supply Chains and Environmental Implications

Vishal V. Agrawal ^{*1} and Ioannis Bellos^{†2}

¹ *McDonough School of Business, Georgetown University, Washington, DC 20057*

² *School of Business, George Mason University, Fairfax, VA 22030*

June, 2015

Abstract

Recently, a new type of innovative business models have been developed based on the premise that economic value is not necessarily associated with the production and distribution of products, but rather with the use and functionality that the products can offer. It has been argued that such models, often referred to as *servicizing* business models, may have a positive impact on the environment because they can enable firms to achieve both economic and environmental sustainability. However, they may also present unique implementation challenges because they require the business-as-usual relationship between the different partners in a supply chain to change from product-based to use- or function-based. In this chapter, we outline a taxonomy of different servicizing business models observed in practice based on different operational characteristics. Based on these characteristics, we also provide an overview of the reasons why servicizing may improve environmental performance. More importantly, we also provide a discussion of why servicizing may backfire and lead to worse environmental outcomes due to the firm and/or consumer decisions. Finally, we identify implementation challenges that may prevent the adoption of servicizing business models in practice.

*Vishal.Agrawal@georgetown.edu

†ibellos@gmu.edu

1 Introduction

The idea of a utilization-focused economy, which puts an emphasis on how products are used as opposed to how they are produced, distributed, or disposed, was first introduced by Stahel (1994). In particular, it was argued that firms should focus on optimizing the use rather than the production of goods because such a focus can result in higher resource efficiency, which can be both economically and environmentally beneficial.

The argument in favor of a utilization-focused economy implies that products should be viewed as having a mere ancillary role in creating value for the firms and their customers. This view motivated further inquiry into the potential benefits of use- or function/outcome-based business models. Along these lines, White et al (1999) introduced the term *servicizing* to describe business models, whose economic value is largely generated through product-based services.

In recent years, servicizing business models have expanded in scope and have become increasingly popular in both B2B and B2C settings. Examples of successful servicizing models include Michelin’s Fleet Solutions (Michelin, 2015), Xerox’s Managed Print Services (Xerox, 2015), Philips’ Lighting Solutions (Philips, 2011), Rolls-Royce’s TotalCare solutions (Rolls-Royce, 2015), Atlas Copco’s Contract Air service (Atlas Copco, 2015), Amazon’s Web Services (Amazon, 2015), Quaker’s chemical management services (Quaker Chemical Corporation, 2015), and Zipcar’s car sharing program (Zipcar, 2015b), to name a few. Although this list is by no means exhaustive, it indicates the diversity of industries in which servicizing has been implemented.

Interestingly, regardless of the scope or the industry, the aforementioned business models share in common the fact that no product ownership rights are transferred from the firm to the end-user. Firms are compensated based on the extent that customers use the products or on the outcome/function that the products provide each time they are used. For instance, in the examples mentioned above, Philips, Michelin, and Xerox charge customers on a per-lux provided, per-mile driven, and per-page printed basis, respectively (see Table 1 for a summary).

One of the main reasons that servicizing has been gaining traction in practice is that it has been viewed by many as a business strategy that can promote environmental sustainability (Rothenberg, 2007). Specifically, it has been argued that the pricing structure (i.e., the pay-per-use pricing) and the fact that firms maintain ownership of the products may lead firms and customers to reduce their production volume and product use, respectively. This would support the view of servicizing as a “green” practice. However, as we highlight in the rest of this chapter, taking a holistic view of the firms’ and the customers’ decisions may reveal environmental drawbacks associated with the implementation of servicizing. In Section 3, we discuss the reasons why servicizing may or may not improve the environmental performance of a supply chain.

In the context of a supply chain, servicizing can be particularly beneficial because it can possibly facilitate the alignment of the incentives of the different supply chain partners. This is illustrated by Reiskin et al (1999) in the context of chemical supply chains, where a buyer’s objective to minimize the quantity of “indirect” materials (e.g., solvents that do not become part of the final product but are only needed during the production process) conflicts with the supplier’s objective of maximizing the volume of

Table 1: Companies implementing servicizing business models

| Company | Type of Offering | Pricing Structure |
|-----------------------|-----------------------------------|--|
| Michelin | Fleet Solutions | Pay-per-mile driven |
| Xerox | Managed Print Services | Pay-per-page printed |
| Philips | Lighting Solutions | Pay-per-lux provided |
| Rolls-Royce | TotalCare (engine maintenance) | Pay-per-hour flown |
| Atlas Copco | Contract Air Service | Pay-per-m ³ of air compressed |
| Zipcar | Car Sharing Service | Pay-per-hour reserved |
| Amazon Web Services | Cloud Computing | Pay-per-GB transferred |
| Quaker Chemical Corp. | Chemical Management Services | Shared savings contract |

materials sold (see Figure 1). A servicizing agreement, such as a shared saving contract, based on which the gains from a reduction in the use of indirect materials are shared between a supplier and a buyer has been shown by Corbett and DeCroix (2001) to increase supply chain profits.

However, the fact that servicizing changes the business-as-usual relationship between the different partners in a supply chain from product-based to use- or function-based may also create implementation challenges. In particular, the misalignment of the incentives of a supplier and a buyer may actually be exacerbated in a “servicized” supply chain. For instance, the preference for a smaller quantity of products is even stronger from a buyer’s point of view when offering servicizing. This is because the buyer is paid on a per-use basis only, which limits the amount of fixed (i.e., purchase) cost that can be transferred to the customers, since higher pay-per-use prices may not allow customers to meet their usage needs. Of course, this preference is at conflict with the supplier’s objective to sell more products or charge a higher wholesale price. In Section 4, we identify the challenges that may actually hinder the servicizing of supply chains.

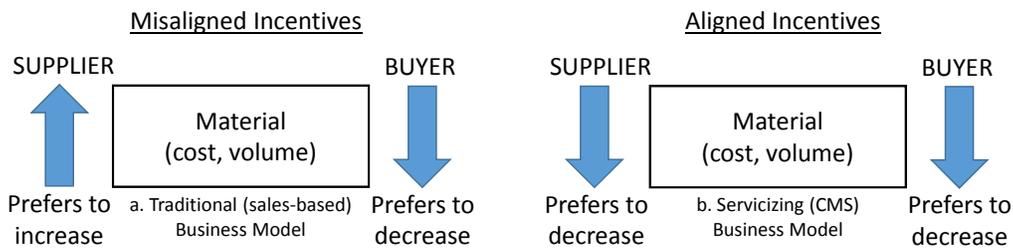


Figure 1: From selling chemicals to selling chemical management services (CMS). Figure adopted from Reiskin et al (1999).

2 Operational Taxonomy of Servicizing Business Models

It is often tempting to construct an all-encompassing definition that tries to characterize what servicizing is. However, this attempt at generality may result in masking the intricacies of servicizing business models and in understating their differences. For instance, in Section 1, we mentioned that the key characteristic of servicizing business models (as opposed to conventional sales models) is that the firm typically maintains ownership of the products and customers pay on a per-use basis. However, this argument does not imply that all servicizing models have the same structure. Given the diversity of contexts where servicizing is observed in practice, it is important to provide a clear and detailed taxonomy of servicizing business models, based on the structural characteristics that distinguish them. Such a taxonomy can help a firm identify how “servicized” its current model is and which operational levers it can use to further servicize their business model. Towards this end, a firm needs to answer the following questions, which are based on an aggregation of the most common characteristics of successful servicizing models observed in practice. This taxonomy has been developed by building on the definition of servicizing as outlined in Toffel (2008). Table 2 provides a summary of the taxonomy of servicizing models, which is explained in detail in what follows.

Table 2: Structural characteristics of different business models

| | Conventional Business Models | | Servicizing Business Models | | |
|-------------------------------|------------------------------|---------------------|-------------------------------------|---------------------------|--------------------|
| | Selling of products | Leasing of products | Print services, pay-for-performance | Sharing programs, rentals | CMS, pure services |
| Firm owns the product | ✗ | ✓ | ✓ | ✓ | ✓ |
| Pay-per-use | ✗ | ✗ | ✓ | ✓ | ✓ |
| Firm bears the operating cost | ✗ | ✗ | ✗ | ✓ | ✓ |
| Resource pooling | ✗ | ✗ | ✗ | ✓ | ✓ |
| Firm is the “end-user” | ✗ | ✗ | ✗ | ✗ | ✓ |

Who owns the product? The necessary condition that a business model must meet in order to qualify as a servicizing business model is whether the ownership of the product remains with the firm¹ rather than with the customer. In other words, customer ownership of the product indicates a conventional sales-based business model. This also implies that offering after-sales services through traditional maintenance contracts where the customer owns the product and the firm charges a fixed or cost-plus fee for labor and/or parts may not qualify as a servicizing strategy. In other words, making the shift to servicizing requires a more significant structural change in the business model than simply diversifying a firm’s offerings through auxiliary services.

As mentioned earlier, the ownership of the product is not the only characteristic of servicizing. Consider

¹The firm may be a manufacturer or a third-party provider who acquires products from a manufacturer.

the model of product leasing for example. Under an operating lease agreement the firm maintains ownership of the product and by charging a fixed fee allows each customer to use a product for a a given period time. From a customer’s point of view, however, other than not acquiring ownership of the product, comparing leasing to a conventional sales model does not yield any major differences.² This brings us to our next characteristic: pricing.

How is pricing structured? Since under most servicizing business models, the firm maintains ownership of the product, the basis of the transaction is no longer on the level of the product but rather at the level of use or function provided. As explained before, the consumers are charged on a per-use level. For instance, the customers of Zipcar are charged based on the total number of hours they reserve a car. It is not uncommon for the customers of a servicizing model to have to pay a fixed fee as well. However, such a fee tends to be significantly smaller than the selling price that a customer would have to pay in order to buy the product under a conventional sales model. For instance, in the case of Zipcar customers pay an annual fee of \$60 in order to gain access to the fleet of cars and then pay as low as \$8 per hour they reserve a car (see Zipcar 2015a).

The pricing scheme used in some servicizing models can be more involved. For instance, in the chemical sector a new type of “shared-savings” contract has emerged according to which both the firm and the customer benefit from a reduction in the overall consumption of chemicals (see Corbett and DeCroix 2001). In this case, the pricing structure is linked to (the reduction of) the use (i.e., consumption) of the products. Additionally, in the aviation sector Rolls-Royce provides engine maintenance services through performance-based agreements under which payment is linked to the engine uptime. Such agreements are also referred to as “power-by-the-hour” in practice. No fees are charged for materials or spare parts used to ensure the operability of the engines. In the defense sector, following the Department of Defense’s guidelines, contractors have also been implementing what is known as performance-based logistics (see Boeing 2015).

Who bears the operating cost? Another characteristic is whether the firm chooses to cover a portion or all of the operating cost associated with the use of the product. This is also related to the pricing. Although use/function-based pricing is considered one of the necessary conditions for servicizing models, determining who to hold responsible for the operating cost of the product does not alter the nature of the business model. Nonetheless, in practice we observe different approaches. That is, servicizing firms may choose to cover the product’s operating cost or not.

Assuming responsibility for the product’s operating cost can possibly foster the impression of a hassle-free and all-inclusive offering. Along these lines, Zipcar covers the operating cost of the vehicles (i.e., cost of gas). Under Rolls-Royce’s pay-for-performance contract, however, the customer is responsible for the operating cost of the engines. This is also the case under Xerox’s managed print services, where customers incur the electricity cost associated with the operation of the printers. In several cases, the firm’s decision of whether to directly assume or to delegate the responsibility of the operating cost to the customer is limited by the technical feasibility of monitoring, reporting and payment mechanisms. For instance, assuming

²The reason we do not categorize product leasing as a servicizing business model stems from the fact that the pricing (most commonly in the form of fixed monthly payments) under leasing is to a greater extent related to the length of the lease and to a lesser extent to the actual use or function of the product.

responsibility for a printer’s electricity cost would probably require Xerox to install additional modules that monitor and report detailed electricity consumption along with the corresponding electricity rates. However, the perceived benefits from doing so may not justify the associated implementation costs.

Is resource pooling feasible? Another important characteristic is whether it is possible for a servicing firm to meet customers’ usage needs through a common pool of (fewer) products. The answer depends to a large extent on the industry and to a smaller extent on the efforts of the firm. For instance, car sharing provides an example of a business model where the firm can exercise such resource pooling. This is possible since not all customers request a car at the same time. On the other hand, it may be more difficult for Xerox to satisfy the needs of multiple customers through a common pool of printers. One of the reasons is that each customer may require physical access to at least a certain number of printers. However, streamlining its customers’ processes and information flow may allow Xerox to better allocate printing capacity and, therefore, to decrease the number of printers it dedicates to each customer. An important thing to note is that although the ability to pool firm resources is more prevalent in servicing models, lack of it does not disqualify a business model from being considered as servicing.

Who applies the solution? Some servicing business models may change the fundamental relationship between a firm and a customer, in that the firm may assume complete responsibility for the customer’s operations. In this case, customers delegate part of their operations to a firm with specialized skills, which is now responsible for taking all necessary actions (e.g., purchasing material, maintenance of the equipment) to ensure delivery of the final outcome (e.g., painted products). Regardless of the industry, the firm, which may have considered itself a manufacturer, effectively assumes the role of a service provider. This has been the case in the chemical sector where in recent years suppliers have been increasingly providing chemical management services (Reiskin et al, 1999).

3 The Green Potential of Servicizing(?)

In order to evaluate the environmental performance of any business model, the total impact created during the production, use, and disposal phases of the product’s lifecycle has to be analyzed. The total environmental impact in each phase is determined by the firm’s decisions (e.g., pricing, resource pooling, etc) and how customers respond to such decisions. It is straightforward to see that if a business model leads to lower impact in one phase, this does not necessarily imply that it will also lead to lower impact in the rest of the phases. As a result, understanding the environmental performance of a business model requires analyzing the effect on the overall environmental impact, which is the aggregation of the total environmental impact in each phase. The overall environmental impact may be primarily influenced by a certain phase of the lifecycle, based on the product type. For example, the majority of the environmental impact of printers happens during the use phase (see Xerox 2010). Moreover, in addition to the per-unit impact of a product in each life cycle phase, the total environmental impact of a business model depends on the firm decisions that influence the volume of production or use. Therefore, a more nuanced approach is needed to determine how each of the main aspects of servicing may influence its overall environmental performance.

In what follows, we present the main drivers of the environmental performance of servicing business

models. For each driver, we present both sides of the coin. That is, instead of only describing why a certain aspect may be environmentally beneficial, we also outline the reasons as to why the same aspect may lead to adverse environmental effects when the firm and customer decisions are accounted for. This is not an attempt to be pessimistic, but to convey that the environmental potential of servicizing is not as straightforward and that the firm's decisions may actually undermine it. By being aware of this, firms and environmental groups can be more cognizant of when a servicizing business model actually has the potential to lead to superior environmental outcomes, instead of backfiring by leading to higher environmental impact.

3.1 Pay-per-Use Pricing

By selling the use instead of the ownership of a product, a servicizing firm effectively transforms the costs that customers incur from a fixed basis to a variable basis. The customer is now charged for every additional unit of usage due to the per-use pricing charged by the firm, which is not the case under a conventional sales business model. This may result in customers curtailing their use of the product, leading to lower use impact under a servicizing model. Consider Zipcar's business model as an example. Customers with moderate usage needs may actually find it beneficial to relinquish car ownership and satisfy their needs only through car sharing, under which it is likely they will drive less due to the higher hourly cost. We should note that in this case, the environmental benefits will also be in the production phase due to the possibly smaller quantity of cars required to be produced (we remind the reader about the pooling benefits of car sharing we mentioned earlier; see Bellos et al (2013) for a treatment of the car sharing business model).

This reduction in use may be amplified by the fact that payments are more immediate and apparent to the user of the product. That is, even if the pay-per-use price under servicizing is the same as the operating cost that customers incur when they own the product, the fact that pay-per-use pricing imposes transparency and accountability may discourage the use of the product. For instance, charging on a per-page-printed basis may require creating a thorough monitoring system that displays detailed printing activity, along with the associated costs, of each user. In the same spirit, customers of Zipcar have their credit cards charged immediately after their reservation, something that when owning a car would happen only at refueling and after several trips.

However, the effect of pay-per-use pricing may not always be environmentally beneficial. Specifically, we need to consider the fact that transforming the fixed cost to variable may enable customers, whose low usage needs do not justify the purchase of a product, to use a product through servicizing. This may increase the overall number of adopting customers, which then may increase the overall product use and the number of products required to meet customers' needs. It is clear that such an increase may result in both higher production and use impact, thereby rendering servicizing environmentally inferior to conventional sales models (for a thorough treatment see Agrawal and Bellos 2015). Consider car sharing as an example: It can be appealing not only to customers who are contemplating relinquishing car ownership but also to customers who normally rely on more environmentally-friendly modes of transportation (e.g., public transportation) to cover their mobility needs. If these customers use a car through a sharing business

model, this may lead to worse environmental outcomes (see Bellos et al 2013).

3.2 Resource Pooling

As we have explained before, pooling refers to the firm's ability, under certain servicizing models, to pool its resources and to satisfy customers' needs through fewer products. The benefits of such resource pooling are fairly straightforward. The firm can create the same customer value by using fewer resources, less energy and material. This supports the move towards a utilization-focused economy where the impact during the production and, as an extension, the disposal phase is minimized.

Upon first glance, the environmental benefits of resource pooling seem to be rather straightforward. However, is it possible that one of the most environmentally-beneficial aspects of servicizing could backfire (i.e., result in higher environmental impact)? To answer this question we need to take a holistic view of the firm's and the customers' decisions and not treat them in isolation. This is because the firms make pricing and production decisions and customers respond to such decisions. Along these lines, pooling can affect the firm's pricing decisions, which subsequently can determine customers' decisions of whether to adopt or how much to use the product. Specifically, through pooling the firm can potentially enjoy savings in its total production cost as it does not need to provide each customer with a dedicated product. This may enable the firm to lower the pay-per-use price it charges in order to incentivize more customers to adopt a product or to increase the extent to which they use a product. However, this lower price may lead to greater adoption, and thus, higher production and/or product use. This implies that resource pooling may instead lead to a higher environmental burden (see Agrawal and Bellos 2015).

3.3 Product Design

The fact that under most servicizing models the firm retains ownership of the products and that it is compensated on a per-use or per-function basis may also incentivize changes in the design of the products. For instance, under a TotalCare maintenance agreement Roll-Royce is paid based on the number of hours that the engines are actually flown. Under such a program, in order to maximize revenue it is in the best interest of Rolls-Royce (but also in the best interest of their customers) to ensure maximum engine availability. Besides using best maintenance practices, an important prerequisite to this would be improving product reliability. It has been shown by Guajardo et al (2012) that servicizing agreements such as pay-for-performance do incentivize manufacturers to improve the reliability of their products. Improvements in product reliability, of course, also benefit the environment because they lead to less frequent product replacement, which decreases the impact due to production and disposal. The same argument can also be made regarding the durability of the products. Namely, it is in the firm's best interest to maximize the duration of time for which it utilizes the same products, which is clearly also beneficial for the environment.

Another product design choice that the firm may determine based on whether it offers a servicizing or a conventional sales model is product efficiency. Product efficiency is particularly important under servicizing because a more efficient product leads to lower operating costs associated with the use of the product, and the firm's revenue is directly linked to the extent that customers use the products. The firm may also have an additional incentive to offer higher-efficiency products if it is the one who bears the

operating cost. However, research has shown that the extent to which the firm improves the efficiency of its products depends on the strength of resource pooling. Specifically, Agrawal and Bellos (2015) show that if pooling is not feasible, then the firm offers lower efficiency products under a servicizing model. This result is reversed if resource pooling is feasible, which allows the firm to invest in higher-efficiency products. Therefore, servicizing does not always result in higher efficiency products. As a matter of fact, offering servicizing may actually be the reason for producing lower-efficiency products. We revisit the effect of efficiency and how it can possibly lead to lower environmental performance in §3.5.

3.4 Product Stewardship

Product stewardship is an approach that advocates for greater responsibilities of the producing firms in decreasing their environmental footprint throughout the *entire* lifecycle of their products (see U.S. Environmental Protection Agency 2012). In Europe this approach has taken the form of an official policy known as Extended Producer Responsibility (EPR; see European Commission-DG Environment, 2014; Lifset et al, 2013). The objective of this policy is for firms to internalize the environmental cost of their products and foster a systems-thinking approach so that opportunities for reducing the environmental impact are identified from the early stages of design to the production, distribution and end-of-life stage of products. Most EPR policies focus on incentivizing firms to recover and reuse their products. The obvious benefits of recovery and reuse are the decrease in the number of products disposed in the landfills and, consequently, the decrease in the number of products that need to be produced to meet customer needs.

Note that under servicizing, a firm automatically maintains ownership of the product, achieving an important premise of EPR (White et al, 1999). Moreover, this may reduce the challenges faced by the firm in order to comply with EPR. This is because any recovery and reuse objectives can be satisfied at a much lower cost compared with a conventional sales model. However, this seemingly straightforward environmental advantage of servicizing comes with a caveat. By retaining ownership of its products, the firm has better control of the secondary market, which it can possibly eliminate by disposing its products in the landfill. Clearly, this would negate the environmental advantage that servicizing offers. See Agrawal et al (2012) for a thorough treatment of these trade-offs in the context of leasing.

3.5 Rebound Effect

In §3.3 we described the different mechanisms through which servicizing may incentivize firms to produce products of higher or lower efficiency. The latter was implicitly assumed to be undesirable. The reason is that traditionally efficiency has been associated with environmental benefits such as energy savings. Therefore, environmentally conscientious firms ought to always offer products of higher efficiency. However, this is not as straightforward of an issue. The culprit is what researchers have named the *rebound effect*. According to the rebound effect, technological improvements that increase the efficiency of a resource may also result in an increase in the overall usage of the resource (see Greening et al 2000). This means that by improving the efficiency of a product a firm may actually encourage customers to use the product more, which can be environmentally detrimental. But what is the role of servicizing in this case?

In §3.3 we mentioned that Agrawal and Bellos (2015) find that the efficiency that firms choose for their products depends on whether resource pooling is feasible. In particular, they find that servicizing may indeed result in products of higher efficiency, but at the same time it may dampen the rebound effect because of the pay-per-use pricing structure used by the firm. Under some conditions, higher efficiency may lead to lower usage under servicizing because the firm charges a sufficiently high pay-per-use price for a more efficient product. Namely, servicizing can be a mechanism that moderates the rebound effect, thus enhancing the environmental benefits of higher efficiency. Therefore, when determining the efficiency of their products, firms should also account for the rebound effect and possibly use servicizing as a means to moderate its occurrence.

The above discussion provides an overview of how the different operational characteristics and decisions influence the environmental performance of servicizing, which is summarized in Figure 2.

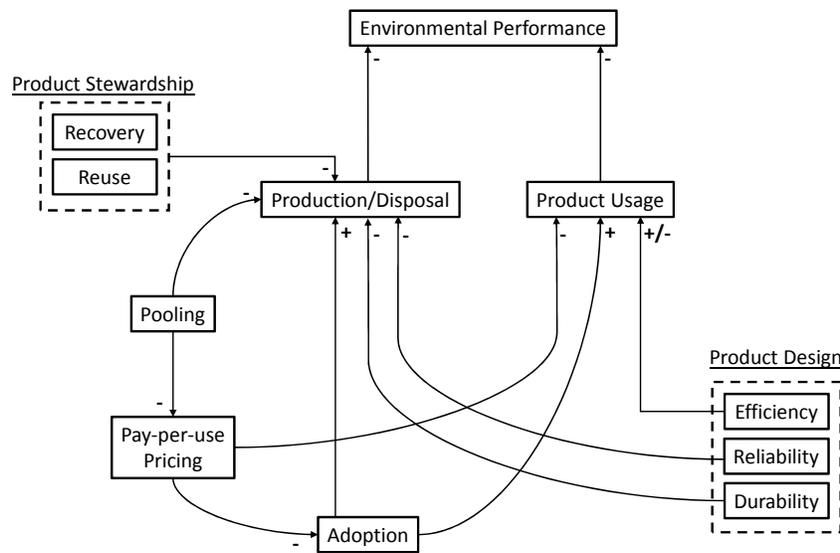


Figure 2: Drivers of the environmental performance of servicizing. Each arrow/arc indicates a “standalone” (i.e., assuming all else being equal) influence. The signs next to each arrow/arc indicate the direction of this influence. For instance, higher pay-per-use price would most likely result in a smaller number of customers adopting the use of the product. Therefore, the arc that connects Pay-per-use price with Adoption has the “-” sign. However, larger adoption increases the quantity of products produced. Hence, Adoption is linked to Production/Disposal with a “+” sign.

4 The Challenges of Servicizing the Supply Chain

The previous section focused on the drivers that determine the environmental performance of servicizing. However, even if a servicizing business model is environmentally superior, this is moot if the firm does not find it profitable to offer a servicizing business model. For that reason, in this chapter we look at implementation challenges that servicizing firms may encounter as they consider adopting servicizing. Regardless of type of the firm (i.e., whether the firm is a manufacturer or a third-party provider), the type of the product or the maturity of the industry, the mere act of servicizing will introduce the firm to at

least some of the following challenges.

So far in this chapter, we have treated servicizing and conventional sales models as two extreme choices for the firm. In practice, however, it is likely to find that firms offer a “hybrid” business model, where the firm not only sells products but also sells the use/function of the products. Namely, a firm may offer both sales and servicizing options and have customers select their preferred option. It is more likely to observe such models being offered by manufacturing firms that want to diversify their offerings, but nothing precludes third-party providers from also providing such a combination. Offering both business models enables the firm to attract a more diverse customer base through better price discrimination. For instance, when simply selling products the firm may not attract customers with low-usage needs. It can do so by offering servicizing since it will charge on a per-use only basis.

While potentially more profitable, the simultaneous offering of both the models may create additional challenges. In particular, the firm needs to price its models such that it does not cannibalize its own demand. For instance, having customers who typically buy a product switch to buying the use of the product may result in lower profitability. Although demand cannibalization is not an issue unique to servicizing (e.g., every firm that sells more than one product type faces the risk of demand cannibalization), managing it can be particularly difficult in a servicizing context (for a recent treatment see Agrawal and Bellos 2015).

Similarly, another critical issue when the firm offers both sales and servicizing options is whether and how the firm should offer a line of products. That is, a firm may have to decide whether to use the same or different types of products through the different business models. The differentiation of the products could be based on their efficiency level. In this case, if the firm chooses to offer a line of products with different efficiencies, the question is whether to offer the higher or lower-efficiency product to the customers who choose the sales or the servicizing model. Again the fact that each model uses a different pricing structure and that under servicizing the firm may be the one bearing the operating cost may complicate the product line decisions. We should note that, as we have already discussed in §3.3 reliability and durability can be additional dimensions based on which the firm may decide to differentiate its products.

Another layer of complexity is added when we consider a supply-chain context. In addition to deciding whether to offer a servicizing model, a sales model or both, the firm has to evaluate different supply chain structures. For instance, the firm could choose among: i) selling products through a retailer and offering servicizing through a direct channel, ii) selling products through a retailer and offering servicizing through the same or a different retailer, iii) offering only servicizing through a retailer or through a direct channel, or iv) selling to a retailer who may choose to offer either or both models. Regardless of the structure, however, the misalignment of incentives may be exacerbated in a supply chain that includes servicizing because of the different nature of the transaction (i.e., quantity-based vs. use-based) and, for that reason, possible coordination issues may be more difficult to address. For studies on the effect of servicizing on the supply chain profitability, we refer the reader to Corbett and DeCroix (2001); Corbett et al (2005); Kim et al (2007).

As the firm maintains the ownership of the product, it is exposed to the risk of adverse selection and moral hazard issues (Toffel, 2008). Adverse selection refers to the fact that a certain type of customers, which is unknown to the firm, may find it beneficial to choose servicizing. For instance, it is customers that

extensively (ab)use a product who may be most interested in participating in a servicizing maintenance agreement since it is the firm's responsibility to ensure the operability of the products. Moral hazard refers to the fact that it is difficult to control the effort that a customer exerts during the use of the product. As one may expect, a customer who owns a product cares more about its resale value and, therefore, exerts more effort and care in using and maintaining it than a customer who uses a product under a servicizing model. We refer the reader to Toffel (2008) for a detailed discussion of these issues.

Finally, under servicizing a firm may face challenges stemming from internal employee resistance. The most common source of such a resistance is the firm's salesforce, who may find a transition to servicizing problematic due to the incentives structure. The reason is that typically the salesforce is compensated on a commission basis, based on the volume of products sold or the value of each transaction. However, these incentives cannot be used for servicizing models because the transaction is not product-based and/or the customer's eventual usage may be difficult to quantify at the start of the transaction and as it may be distributed over a longer period of time. Therefore, different performance metrics and incentives would be required to motivate the salesforce for servicizing business models.

5 Conclusions

Servicizing has been positioned as an innovative strategy through which firms can transform their business models to achieve economic and environmental sustainability. This chapter takes a closer look at this strategy and focuses on examining what differentiates servicizing business models from the more conventional sales models.

It is true that academic and managerial interest in the topic of servicizing has been growing for the past several years. However, the message regarding the potential of servicizing as a business model can seem to be muddled in a plethora of definitions and different contexts. For that reason we take a "unifying" approach that attempts to describe in the least theoretical way possible what servicizing is, what its key differentiators and operational determinants are, and what challenges a firm may face during the implementation of servicizing. We motivate our discussion based on examples of firms with successful servicizing models. Our intention is not to provide an exhaustive survey of research or business practices, but rather to convey in a structured manner our argument that servicizing should not be treated as business as usual but rather as an innovative way of conducting business with distinct operational and structural characteristics.

One of the main reasons that servicizing has attracted the attention of researchers and practitioners is its purported potential as a green business model. For that reason we devoted a significant part of this chapter on describing the key arguments for the environmental superiority of servicizing. More importantly, we also provided a discussion of the counter-arguments for why servicizing may lead to higher environmental impact. This provides a sobering view to the claims in practice that servicizing may lead to greatly improved environmental outcomes. We hope that this chapter provides a framework for firms and environmental groups to assess the environmental benefits of servicizing.

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