CHALMERS

# Exploring the potential market for servitization in the stainless steel industry

*Master of Science Thesis*
*in the Management and Economics of Innovation Programme*

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## Abstract

The stainless steel industry is exposed to strong competition and profit margins are low. In such an environment, companies may seek to differentiate their offerings by providing value adding activities. Servitization is a concept which can be related to value adding activities and not much has been written about servitization in a process manufacturing industry. Moreover, not all industries are suited for servitization and therefore an investigation of the market potential is needed. Therefore, the purpose of this thesis is twofold: to provide an evaluation of the market potential for value adding activities in the stainless steel industry and also shed light on servitization, as a concept, in this industry. This was done in collaboration with Stainless Inc., a stainless steel company, and the findings were mainly based on qualitative interviews with industry professionals.

The empirical findings describe the investigated market segments: infrastructure, water gates, water treatment, and pulp and paper, in detail. In brief, three types of value adding activities are identified: *material packages* (e.g. package assembly or logistics)*, product-related services* (for example welding and installation at site), and *project-related services* (such as design or project management). These activates are requested on the market today and carried out by different actors such as distributors and subcontractors.

To examine which market segments that seemed most suitable for value adding activities a conceptual framework, with seven determinants, was developed and used to analyze the gathered data. Segment size and growth, downstream profit margins, and competitive intensity were three of these determinants used when evaluating the suitability. The analysis showed infrastructure and water gates as the most appropriate segments, while the water treatment as well as pulp and paper segment were less convincing. Another question raised was if the market demand in the stainless steel industry was in line with a turn towards servitization. It was found out that, despite absence of *installed-base* products, which is a key element in the traditional view of servitization, the market demand in the industry was to some extent in line with a turn towards servitization, considering the demand for different product- and project-related services on the market.



Keywords: S*ervitization, value adding activities, stainless steel, market research*

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# 1. Introduction

The steel industry is a highly cyclical and competitive industry. It is dependent on other industries such as automobile, construction and energy industries, which drives the demand of steel. Steel is a commodity which is easy to manufacture but hard to differentiate. The steel manufacturing process is capital intense and associated with high fixed costs. Strong bargain power of key buyers in the construction and automobile industry also decreases margins of steel companies. This makes economies of scale important to be profitable (Marketline, 2014).

The stainless steel industry is, like the steel industry, exposed to strong competition. More and more products are being commoditized, and thereby, profit margins are decreasing. Stainless Inc., the focal company of this thesis, has a high cost structure, and combined with the fierce competition in the industry this has led to low margins on their products. Previously, this mostly concerned the standard products but as of late the margins have decreased in the special plate segment as well. A commoditization of special plate products is about to take place. To cope with this, Stainless Inc. has begun to differentiate their offering by providing additional value adding activities for their customers. These value adding activities (hereafter referred to as either: value adding activities, value adding products, added value products or simply added value) can be a variety of activities, from further processing of the thick plate to pure services such as consultancy or blueprint services. These activities are most commonly performed by a third party such as engineering consultants or fabricators.

## 1.1 Introduction to focal company

The focal company of this thesis is Stainless Inc. They are a global stainless steel producer headquartered in Europe, where they also have the majority of their production. In 2013, the company's total sales was in the span of 4,000 to 8,000 € millions. They have a global market share in the range of 5 to 15 percent and the number of employees in 2013 was between 10,000 and 20,000.

Stainless Inc. is divided into a number of business units, responsible for different types of stainless steel products and regions. The constituent of this thesis is the business unit concerned with the company's thick plate production in Europe. Stainless Inc. is among the market leaders in thick plate with a global market share in the range of 8 to 20 percent. The

thick plate business unit mainly serves the market segments pulp & paper, building & construction, desalination, oil & gas, energy and chemical tankers.

### 1.2 Problem description

In the context of this thesis a value adding activity is an activity which is currently not being pursued by Stainless Inc. or is being pursued but is put in a new context or market. Thus, a value adding activity is something new to Stainless Inc., alternatively something old which is put in another use than it currently is. One common type of such value adding activities is servitization carried out by manufacturing companies that for so many years have based their business logic on production of goods and not services. From the theoretical perspective also, servitization was invented by Vandermerwe and Rada (1989) and is generally thought of as "…the process of creating value by adding services to products." (Baines, Lightfoot, Benedettini & Kay, 2009, p.547). Drivers behind servitization are often financial, strategic or related to marketing (Baines et al., 2009). A common denominator in research about servitization is that they usually focus on companies which deliver a product in need of maintenance and/or a product which can be leased. Examples are: Xerox (photocopiers), ABB (power generation), and Nokia (network equipment). Not much is written in the field about process manufacturing companies, such as Stainless Inc.

The choice to pursue more value adding activities is a top-down decision taken by the management of Stainless Inc. in an effort to gain higher profit margins on their sales. This is also one of the main reasons normally used to justify a turn towards servitization (Wise & Baumgartner, 1999). However, not all industries are suited for this type of downstream movement and therefore a market research of the target industry, in this case the stainless steel industry, is required.

### 1.3 Purpose and research questions

The purpose of the thesis can be divided into two parts: The first part is to explore the market demand and potential for added value products within the stainless steel industry, and more specifically the thick plate stainless steel industry. According to Stainless Inc., this type of offering from a steel producer is virtually non-existent within the industry today. Therefore, this study will investigate the demand for such an extended offering. The second part of the purpose is to investigate the concepts of servitization in a process manufacturing industry. There is not much written on servitization in the process manufacturing industry, which the

steel industry is a part of, and therefore the authors hope to contribute by spreading light into this research area.

The purpose can be fulfilled by answering the following research questions:

- How can the market demand of value adding activities in the stainless steel industry be described?
    - What are the main characteristics of the demand?
    - For Stainless Inc., which market segments are the most attractive to approach with value adding activities?

Based on the answer to the first question, the following question will be investigated.

- Is a turn towards servitization in line with the market demand for the stainless steel industry?

### 1.4 Delimitations

The thesis tries to answer the question about market potential for servitization. Due to lack of both time and other resources, a complete study of every single sub segment of the stainless steel thick plate market was not possible. Instead the authors had to try and choose the segments which showed the most potential at an early stage. This selection was done by input from two different sources. Firstly, internal interviews at Stainless Inc. were used as a starting point. Secondly, external interviews with industry experts pointed to which segments that were likely to be most interesting. More details on how the segments were chosen are found in the sampling section of the *Methodology* chapter.

Furthermore, the thesis is focused on the Swedish region of the market, though in some cases the findings are also expanded to other regions. As such, the findings and conclusions may not be applicable on a global scale.

# 2. Literature review

This section of the thesis introduces literature used to carry out the research as well as to develop the conceptual framework. The section starts by looking at strategic marketing analysis by answering questions such as: What are the different parts of a marketing analysis, and what is most important to consider when performing an analysis? Following is a section about servitization looking into the questions of: What are the drivers behind servitization and under which market conditions does it seem most reasonable to servitize? Finally, the conceptual framework used to address the research questions is presented.

## 2.1 Strategic marketing analysis

The pressure on firms to be more market-oriented has been steadily growing with globalization, which creates a more dynamic and complex marketplace (Aaker & McLouglin, 2010). A market-oriented firm is expected to "gather, interpret and use market information in a more systematic, thoughtful and anticipatory way than less market-oriented firms" (Kuada, 2008, p.18). Slater and Narver (1995) describe a market-driven firm as a firm with the following three characteristics: customer orientation, competitor orientation and interfunctional co-ordination.

A customer-oriented firm possesses the ability to interact effectively with customers because of its great knowledge about customer needs, expectations and behaviors (Kuada, 2008). To be competitor-oriented means to continuously acquire information about competitors' capabilities and market response patterns. Lastly, the interfunctional coordination will help a company to channel information quickly through different functional areas and in that way be responsive to changes in the market (Slater & Narver, 1995).

Conducting a strategic market analysis is the appropriate first step towards building a strategy in the dynamic marketplace that exists today. A market analysis includes customer, competitor and submarket analysis (Aaker & McLouglin, 2010).

### 2.1.1 Customer analysis

Segmentation, customer motivations and unmet needs are the constituents of the customer analysis. According to McDonald and Dunbar (2012) market segmentation is "central not only to marketing but also to every other corporate function". A clear definition of different segments makes it possible to, in the next step, understand what brings value to the customers within the different segments (McDonald & Dunbar, 2012). How to define the segments are not always self-evident and it can, and should, be done based on a wide range of variables.

Among the most frequently used variables are size of firm, type of organization, location, price sensitivity and user type (Aaker & McLouglin, 2010).

After having defined the different segments, the next step should be to gain an understanding of the customer motivations (McDonald & Dunbar, 2012; Aaker & McLouglin, 2010). Important questions to answer during this phase should be: What elements of the products/services do customers value the most? What are the customers' objectives? Are there any changes occurring in customer motivation? For understanding customer motivations, qualitative research focused on individual interviews with customers is the most powerful tool (Aaker & McLouglin, 2010). As with the different types of customers, the motivations can be grouped in to segments based on their characteristics and their strategic importance.

The last part of the customer analysis, according to Aaker and McLouglin (2010), would be to explore the customers' unmet needs. These unmet needs may represent opportunities to create new value propositions that can result in a competitive advantage. This part includes understanding not only how the firm itself satisfies customers but also how the competitors' value proposition meets customers' needs now and in the future (McDonald & Dunbar, 2012). Important questions to answer for this part should be: Why are some customers dissatisfied? What unmet needs can customers identify? Are there some unmet needs that the customer cannot identify?

### 2.1.2 Competitor analysis

The second part of Aaker and McLouglin's (2010) strategic marketing analysis is the competitor analysis. In this analysis the competitors are identified and evaluated. While the primary competitors may be easy to identify, it is important to also understand the indirect and potential competitors. Primary competitors are those who compete with virtually the same product e.g. Boeing and Airbus. However, there may also be indirect competitors, which offer a different product that may serve as a substitute, e.g. soft drinks to energy drinks. Potential competitors are firms that currently do not compete on the market but may enter in the future (Aaker & McLouglin, 2010).

After identifying the competitors, these may be segmented into strategic groups depending on their characteristics, such as size and aggressiveness, and their assets and competencies. In order to understand the competitors there are a number of elements that should be investigated: strengths and weaknesses, financial performance, image and positioning,

objectives and commitment, strategy, organization and culture, cost structure and exit barriers (Aaker & McLoughlin, 2010).

### 2.1.3 Submarket analysis

For the submarket analysis, an appropriate starting point for analysis would be the market size and growth of the submarket. This may quickly determine if the submarket is interesting to evaluate further or if it can be written off at once. If the size is deemed sufficient enough, the next step would be to evaluate the profitability of the submarket. This could be done by for example using Porter's five-factor model (Aaker & McLoughlin, 2010).

After size, growth and profitability is evaluated, the analysis should turn to a number of more practical factors which are helpful when entering a new market. These include key success factors, distribution systems, cost structure and risks.

## 2.2 Servitization

This chapter introduces the concept servitization. The section is distributed as follows: First, definitions of servitization are discussed. This is followed by a section on drivers behind, and problems with, servitization. Finally, a thorough discussion on when it is proper to servitize, and under which market conditions it may be favorable to do so, is given.

### 2.2.1 Definition of servitization

In the manufacturing industry a service can be thought of as an "economic activity that does not result in ownership of a tangible asset" (Baines *et al*., 2009, p.554). This definition is used throughout the paper and includes activities such as maintenance, insurance and consultancy, to name a few. The term *servitization* was coined by Vandermerwe and Rada (1988) who observed that companies offered gradually more ´bundles´ consisting of customer-focused combinations of goods, services, self-service and knowledge. These packages consisted of an increasingly portion of services, and Vandermerwe and Rada (1988) named it servitization of businesses. Later definitions such as: "adding extra service components to core products" (Verstrepen, Deschoolmeester & van den Berg, 1999, p.539) also focus on adding services to an existing product. Baines *et al*. (2009, p.555) stated that "servitization is the innovation of an organization's capabilities and processes to better create mutual value through a shift from selling product to selling PSS." (PSS is an abbreviation for Product-Service System, an integrated arrangement of product and service which creates value in use, a consequence of servitization (Baines *et al*., 2007)). This definition also targets the company's capabilities, and implies that servitization is a process which changes the company's business model. Thus,

servitization can be seen as an ongoing process which a company undertakes to gradually offer more services in conjunction with traditional products with the aim to add additional value to those products.

Olivia and Kallenberg (2003) introduced a product service continuum (Figure 1) which shows different degrees in the servitization process. Ranging from a product offering with a service attached to it, to the other end of the continuum, a service with a product attached to it. Companies have to act differently depending on where on the continuum their current business is situated and where they intend to be in the future.

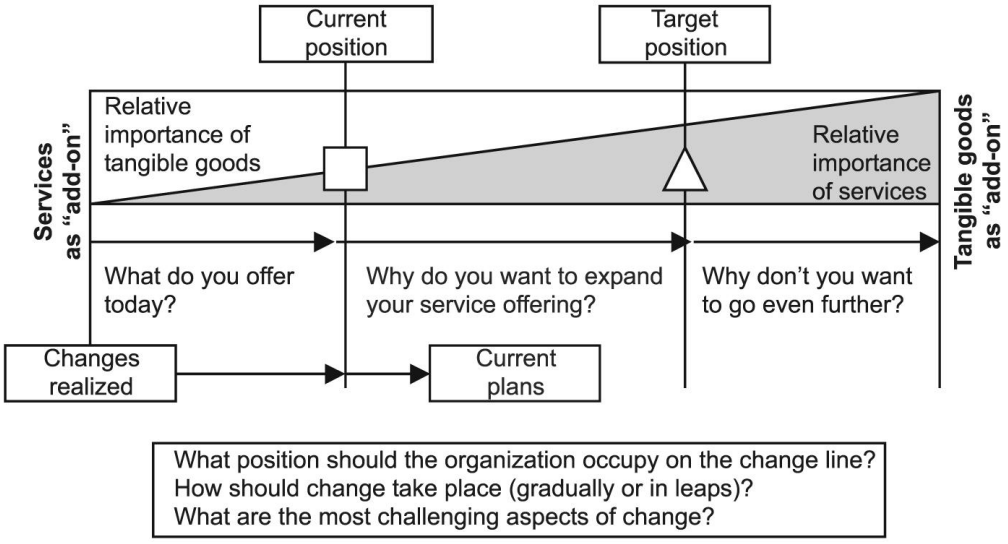


**Figure 1. The product service continuum. Source: Olivia & Kallenberg (2003).**

### 2.2.2 Drivers behind servitization

The main drivers or incitements which attract businesses to move towards servitization are three in number: financial, strategic and/or marketing related (Baines *et al*., 2009).

Firstly, financial incitements are more stable incomes and higher profit margins. Wise and Baumgartner (1999) approximate that for a manufacturer with high-installed product base (e.g. automotive and aerospace) the revenues from services can be as large as one or two magnitudes higher than from new product sales. Slack (2005) approves and adds that a high revenue potential exists in the high-installed product base firms. Ward and Graves (2007) show the importance of aftermarket services in the aerospace industry, in some cases over 50 percent of the revenues are from aftermarket services alone. Sawhney, Balasubramanian and Krishnan (2004) show examples where companies (e.g. GE and Hewlett Packard) have been able to keep stable, or even increase, revenues despite a considerably drop in sales, this due to increased focus on integrated solutions and services. Neely (2008) agrees that, on average,

firms increase their revenues by adding services but also shows that the increased costs from introducing services sometimes take away the gain of increased revenues, thus actually lowering the profit margin instead. This is called the *service paradox*, increased offerings lead to escalating costs to a point where the service is no longer profitable for the company (Gebauer, Fleisch & Friedli, 2005). Moreover, product-service sales have a tendency to be less price sensitive (Malleret, 2006) and more resistant to economic cycles (Gebauer & Fleisch, 2007; Olivia & Kallenberg, 2003) than product sales alone.

Another driver for servitization is strategic incentives which are normally concerned with establishing competitive advantages. By providing services, manufacturing companies differentiate their offerings and open up for new competitive opportunities. A competitive advantage gained through a service is thought to be easier to defend since these are more difficult to imitate (Gebauer & Friedli, 2005; Gebauer, Freidli & Fleisch, 2006), in contrast to strategies such as low pricing and production innovation leadership where competitive advantages is harder to maintain (Gebauer & Fleisch, 2007; Mathieu, 2001). In addition, differentiating strategies to add services to products may result in less focus on price which may improve margins for the firm (Malleret, 2006) and in that case satisfies both financial and strategic incitements.

Finally, the last major driver behind servitization is marketing related. By offering services firms may find new marketing opportunities. For example, a firm offering maintenance may be able to sell additional products to customers which they are visiting. The service part of the offering is known to influence the purchasing decision (Mathieu 2001), especially in B2B markets (Olivia & Kallenberg 2003; Auramo & Ala-Risku, 2005), where pressure to create flexible firms and focus on core competencies frequently lead the outsourcing of services (Slack 2005; Auramo & Ala-Risku, 2005).

To summarize, the three main drivers for servitization are financial (stable income, profit margin), strategic (competitive advantage), and marketing related (additional sales, customer loyalty, market opportunities).

#### 2.2.3 Problems with servitization

There are also problems with servitization. One is that manufacturing firms often fail to reach acceptable returns from their new service business (Gebauer et al., 2006). This reconnects with the financial drivers behind servitization discussed above and is called the service paradox. The increased cost to finance the service offering sometimes outweighs the revenues

earned which leads to that the intended objective of the service is not reached. To overcome the paradox the companies need to increase their service awareness, accept risks with and believe in the potential of the service (Gebauer et al., 2005). Gebauer et al. (2006) write about six success factors to achieve high service revenues. In short, those factors imply an organizational change towards a more service-minded organization. The factors focus on higher revenues but somewhat ignore the cost side of the equation.

Another reason for problems with servitization, related to the success factors described by Gebauer et al. (2006), is the organization culture. There may be a conflict between a manufacturing culture, on the one hand, and a service culture on the other hand. A manufacturing culture is prototyped by focus on economies of scale and efficiency to achieve competitive advantages while flexibility and variety is regarded as costly. A service culture is prototyped by customization and innovation, and regards variety and flexibility as ways to create profits (Bowen, Siehl, & Schneider, 1989). These two understandings can be seen as a clash between dominant culture and counterculture (Martin & Siehl, 1983), where the manufacturing culture is the dominant culture. One way to mitigate this conflict is to step-wise turn the manufacturing culture towards a more service-minded culture by combining efficiency and flexibility. Also, management must think differently about what a service is and what a product add-on is (Gebauer et al., 2006). One example is that in a manufacturing culture it is common to give away installation for free as a product add-on, which is counterproductive as there may be a potential to charge for this add-on and instead call it a service. These types of contrary views must be balanced and managed to be able to servitize successfully.

### 2.2.4 When, and under which market conditions, to servitize?

When manufacturing firms search for service opportunities on the market it is usually in one of two directions, either along the product's life value chain or along the customers' activity chain. The product's life value chain includes services such as installation, maintenance and disposal, while the customers´ value chain includes activities such as financing, design, and training (Tan, McAloone, & Matzen, 2009). A servitizing firm is assumed to have expertise knowledge and experience of their products which they can use to leverage and offer solutions that another firm cannot (Matheui, 2001). Independently from whether the firm sees an opportunity, and has its expertise, there have to be sufficient market demand for servitization to be feasible.

Even if a company, from its point of view, sees opportunities to servitize it is not certain that the market in which the company operates is suited for servitization. Wise and Baumgartner (1999) specify three factors (divided into nine metrics) that could be used to evaluate the attractiveness of a "downstream move" (moving towards the end consumer in the value chain). The first factor is the attractiveness of the downstream market itself:

- Attractiveness of downstream business
    - Ratio of installed base to new product sales
        - If there are many installed products compared to annual sales of new products a downstream move towards services is attractive. This due to the likeness that higher revenues (or more revenues) can be achieved through services.
    - Life cycle economic activity as a multiple of product cost
        - The customers' life cycle cost of the product compared to the products price. If the customer spends more money on repairing and entertaining the product it may be favorable to provide service to the product.
    - Difference between downstream margin and product margin
        - A higher difference in margins gives more incentives to move downstream.

By looking at those elements an overall sense of the downstream markets possibility for profitability can be established. For example, a market with a high ratio of installed base products compared to new product sales, a high customer usage cost over the product life cycle, and a big positive difference between the downstream margin and the product margin is attractive to consider a downstream move in, it is likely to provide higher than average profitability. To make a full evaluation if servitization is reasonable the two other factors, customer relationships and distribution channels, also have to be considered:

- Importance of customer relationship
    - Magnitude of product-based differentiation
        - If the product itself is commoditized differentiation must be made through some other measure and a downstream move may be vital to keep margins and profitability.
    - Market share of top five customers

        - If your top five customers have a big market share (high customer concentration) they can squeeze prices on the product. In this scenario a downstream move towards services can be vital to keep revenues and become stickier (making the customer more dependent on your business).
    - Share of total profit earned from top 20 percent of customers
        - For the same reason as above. If a large share of the profits comes from few customers the company becomes very dependent on the goodwill of those customers. Downstream move may be necessary.
- Power of distribution channel
    - Distribution and selling expenses as a percentage of product price
        - If a third party distributor charges high prices for distributing it might be worth to consider a downstream move.
    - Degree of channel concentration; market share of top five distributors
        - If the top five distributors have a large part of the market it might be necessary to move downstream to avoid getting too dependent on the distributors.
    - Degree of channel innovation or multiplication
        - A highly dynamic distributor market may result in opportunities for downstream moves.

The importance of understanding the customers' processes and business increases with the level of servitization (White, Stoughton & Feng, 1999) and as a company move from selling products to selling (more) services, a shift from transactions to relationships, the requirements of the organization change (Neely, Benedettini & Visnjic, 2011). Considerations of the company's distribution channels also have to be made. If going downstream, distributors may become competitors, a possibility that the servitizing firm must be aware of, but if the company sells directly to the end customer this issue is of less importance.

A concept closely related to servitization is Product-Service System (PSS). A PSS integrates products and services with the basic idea to sell solutions to customers, not just a product or a service (Müller, Kebir, Stark, & Blessing, 2009). As such, PSS can be seen as a result of servitization and it can therefore also be of interest to see what earlier research conclude about PSS and market factors. In one paper, Fan and Zhang (2010) develop a theoretical framework which aligns PSS with market forces. The goal is to find a suitable strategy for a product-

service system depending on the type of market the company is facing. The market forces which they use in their framework are market turbulence, technology turbulence, and competitive intensity. Market turbulence is the rate of change in customer preferences and composition of the customers. A more turbulent market makes it necessary for a company to adjust its offerings more often to meet the changing demands of customers. Also, in rapid changing market environments customers seem to accept servitized product offerings more readily (White, Stoughton & Feng, 1999). Technology turbulence refers to the rate of technological progressions in the industry. In an industry with a high rate of technological advancements (i.e. IT) the product life cycle tends to be shorter, and customer expectations and preferences changes more quickly, this may lead to that customers prefer to lease products instead of buying them. Finally, competitive intensity refers to the degree of competition in a given industry. In a highly competitive industry firm might seek to servitize their business to differentiate themselves from the competitors while in a less competitive market there may be no reasons (incitements) to do that. Technology turbulence is also one reason for why Xerox and IBM chose to servitize their businesses (White, Stoughton & Feng, 1999). The rapid technological changes redefined their industries and forced them to rethink their business model.

Another important factor to consider when servitizing a business is that new entrants must prove themselves preferable to the service provider they are to replace (White, Stoughton & Feng, 1999), either by being more economically advantageous or by delivering a higher quality. Furthermore, it is often not enough to be "slightly better" than established firms since switching costs may be high for the customer, which can cancel out the gain of changing supplier.

It is not only the market conditions that decide if servitization is a feasible strategy to pursue or not. The manufacturing company´s products are also a factor to take into consideration. As an example, capital equipment such as machinery and production tools are deemed to be a promising category for PSS (Windahl, 2007), due to its complexity and need of maintenance among other things. More generally, for a manufactured product, if one of the following conditions apply, a PSS strategy is likely to be favorable (Tukker & Tischner, 2006): the product has a high cost to either operate or maintain; the complexity of the product requires special skills to manage, design, operate and/or maintain; products that may inflict considerable costs if not used correctly; products where downtime or operational failures are not tolerated; products with a long life cycle; products with a few major customers. Capital

goods have many similarities with these conditions, a further indication that those product categories are fitting for PSS. There is no clear evidence that mature products should be a better fit for PSS than a newly introduced product, or vice versa, there have been successful PSS in both these types (Tan, McAloone, & Matzen, 2009).

## 2.3 Conceptual framework

To be able to answer the research questions a conceptual framework was developed by using parts of theory from the previous section. Figure 2 shows the conceptual framework. The determinants (determinants and factors are used interchangeably) used in this framework are explained below.

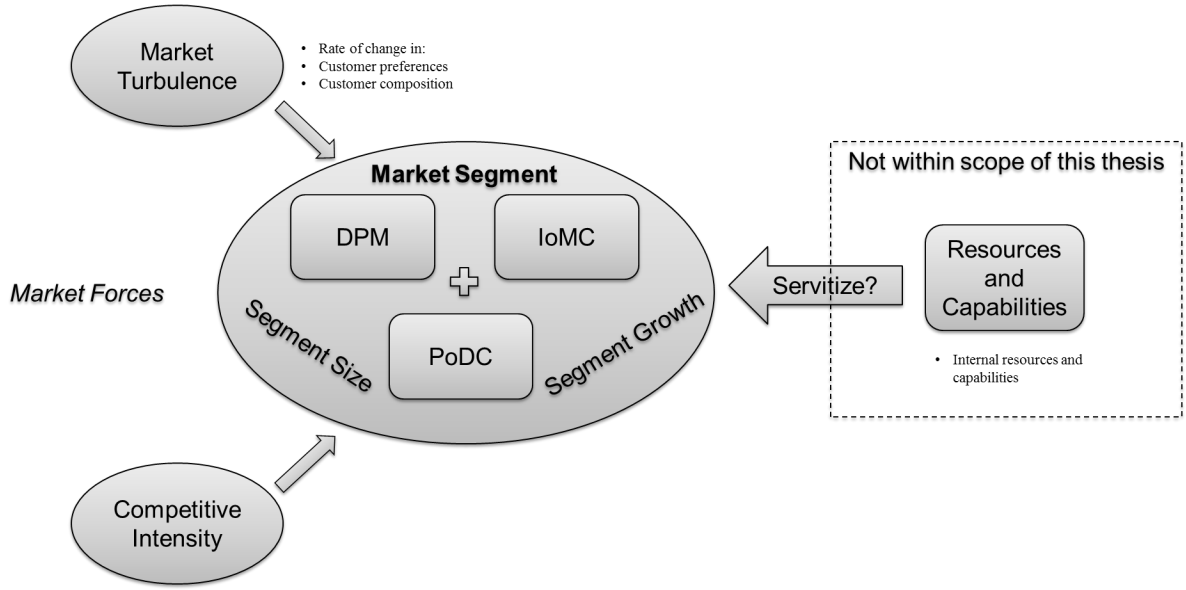


**Figure 2. A model of the conceptual framework.**

The two leftmost factors, market turbulence and competitive intensity, represent market forces, which influence the customer demand and competition in the given market segment (see the *Empirical Findings* section for description of the market segments). High market turbulence means that preferences and composition of customers change rapidly, which forces companies to be market oriented and to change their offerings more often to meet the demand. In such an environment the probability that servitization may be interesting increases since the possibility to be closer to the customer through service activities can give valuable insights of coming trends and preferences. The contrary, with a low market turbulence, defined industry norms make it more difficult, and not even necessary, to "try something new", since the customers are the same today as tomorrow and they want the same today and tomorrow. Thus, in the conceptual framework, high market turbulence is a positive indicator of a servitizable segment. If the competitive intensity in the segment is high there are more

incentives for companies to servitize their businesses. The reason behind this is that more competition drives the companies to differentiate themselves from their rivals. In a low competitive market this may not be the case, since there are not as much to gain from differentiating. In this framework competitive intensity is measured as the competition Stainless Inc. experiences as a producer relative to the competition in downstream levels of the chain, and a higher relative competition indicates that servitization may be advantageous. Market turbulence and competitive intensity is placed outside the market segment in the conceptual framework, the motive behind this is that they are not necessarily internal forces. Market turbulence may introduce new customers from outside the segment and new entrants could be companies from other segments, therefore they are placed slightly outside the segment. Another market force which was considered a determinant was technology turbulence. Although, in the end it was left out from the conceptual framework for these reasons: in a high technological turbulent market the idea in existing theory is that life-cycles of products are shortened. This in turn may be a reason for customers to prefer leasing solutions (or other solutions to avoid ownership), to not risk that the product becomes obsolete. The product in this thesis is not one who becomes obsolete or has a short-life cycle, and is not going to be leased; therefore this argument for servitization is not valid in this context.

Now moving into the internal part of the market segment the next two factors in the conceptual framework are segment size and segment growth, two important measures to consider when entering a new market or expanding offerings in a familiar market. The segment size is in this thesis expressed in metric tonnes of stainless thick plate sold each year. The idea behind this is that with a larger amount of stainless sales in a given segment the potential to servitize and the gain from it should be higher. A similar reasoning is used on segment growth, higher growth gives higher potential. In addition, these are two factors that are always important to consider when determining if a potential offering could result in the desired return on investment.

The last three factors used to evaluate if servitization is attractive are: downstream profit margins (DPM), influence of major customers (IoMC), and power of distribution channels (PoDC). These determinants are derived from Wise and Baumgartner's (1999) article about downstream moves. As Stainless Inc. operate at the highest tier in the value chain (or next highest, raw materials would be even higher). To sell added value products or services and

servitize their business, Stainless Inc. need to move downstream and therefore these factors are used for the evaluation.

The downstream profit margins are one of the part factors in determining the attractiveness of downstream business. If the profit margins further downstream are higher than the current positions margins a downstream move and servitization may be beneficial. In this case, the DPM factor is deemed high. The other two factors in the original framework (Wise & Baumgartner, 1999) are the installed base to new buy ratio, and the life cycle economic activity as a multiple of product cost. These factors are not included since the product itself is not suitable to be evaluated with these determinants (this is further discussed in the *Analysis* section).

Influence of major customer is based on two factors from Wise and Baumgartner's (1999) framework: market share of top five customers; and share of total profit earned from top 20 percent of customers. High influence from major customers implies that a downstream move might be attractive. In the original framework from Wise and Baumgartner (1999), magnitude of product-based differentiation was also a factor in their category 'importance of customer relationships'. This was removed due to the nature of this thesis. Stainless Inc. are already aware of the commoditization of their products and this was a reason for doing this research in the first place. High power of major customers does imply servitization, to get stickier and "lock-in" those customers.

The power of distribution channel includes: distribution and selling expenses as a percentage of product price; degree of channel concentration; degree of channel innovation or multiplication. If the powers of the distribution channels are high there may be incentives to servitize, either through bypassing the distributors and keeping more profits or by collaborating more closely with them to ensure a long lived relationship. These incentives may not be as prominent if the channels power is low.

Finally, the resources and capabilities box (with dashed line) on the far right of the conceptual framework is not in the scope of this thesis. It is there to illustrate that even if the market forces and market segment seems favorable for servitization, the company´s resources and capabilities must be examined to decide if servitization is possible.

Table 1 is a presentation of the determinants used to evaluate the market segments' suitability for servitization. The table is used in the *Analysis* section to answer the research questions.

Three different levels: low, medium, and high are used to grade the factors in each segment and a high score points in favor for servitization. No specific weights have been assigned to the factors, since the authors did not find any reasonable way to quantify their respective importance. However, that does not mean that they are of equal importance in the evaluation. For example, high scores in segment size and segment growth cannot outweigh a low score in downstream profit margins since the latter can be viewed as a qualifier for servitization to be interesting in the first place.

**Table 1. Table used to evaluate factors used in the conceptual framework**

| Factor | Low | Medium | High |
|---|---|---|---|
| **Market Turbulence** | | | |
| **Competitive Intensity** | | | |
| **Segment Size** | | | |
| **Segment Growth** | | | |
| **Downstream Profit Margins** | | | |
| **Influence of Major Customers** | | | |
| **Power of Distribution Channels** | | | |

# 3. Methodology

This chapter describes the general research strategy used in this thesis. The chapter starts with an illustration of the research process and explains how the research has been conducted in broad terms. Following is a section on basic research considerations and commitments. Thereafter follow a discussion on the overall research design, which is descriptive and exploratory and involves multiple case studies. The main method used for collecting data, interviews, is presented in the next section. Subsequently discussions on data analysis and the quality of the research are held.

## 3.1 Research process

The overall research process is illustrated in Figure 3. As seen in the figure the process has not been completely linear, instead iterations has been made throughout the process. The main points of iterations have been during the planning phase and the data gathering phase.

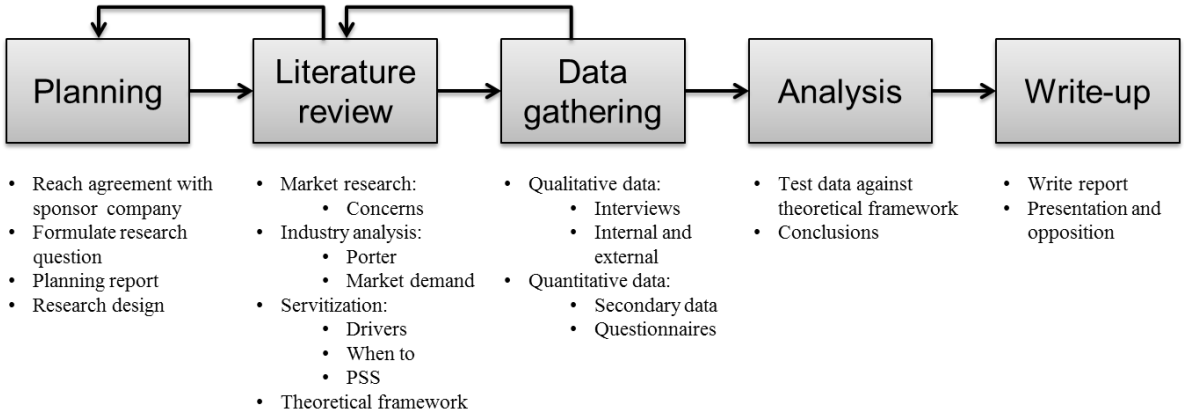


**Figure 3. Illustration of the research process.**

The process started with a discussion between the authors and Stainless Inc. about the scope of the research project. When a common understanding had been agreed further discussions with Chalmers about the appropriateness of the scope was held. These discussions led to the forming of the research questions which were documented in a planning report. The research design described below was developed through study of literature and discussions with supervisors. Thereafter a deeper literature study was conducted to broaden knowledge, create interview templates, and to develop a theoretical framework used to analyze data. The data gathering and the literature study were mostly conducted in parallel as the authors found new information continually and needed to keep updated when that happened. The analysis and write-up phases also overlapped to some extent.

## 3.2 Considerations and commitments

This study takes an applied research approach. Applied research aims to provide means to solve problems and improve activities and has intended practical utility. This in contrast to basic research which aims to generalize theoretical understanding (Bryman & Bell, 2011). In this thesis Stainless Inc. functions as the external sponsor which has interest in the demand for value adding activities on the market. This falls in line with the authors' interest in market analysis and servitization which are the theoretical areas the thesis build upon.

The research strategy in this thesis is primarily of inductive character. An inductive research process takes its starting point with observations or another data gathering method, which is later analyzed to form models and theory. This in contrast to a deductive process which is based on theory and the gathered data is used to test hypotheses formed from the mentioned theory (Bryman & Bell, 2011). The authors gathered primary qualitative data from interviews with different actors in both the stainless steel industry as well as in industries where stainless steel is used. The qualitative data was analyzed in search for patterns. A rule of thumb is that a qualitative study is associated with an inductive research process while a quantitative study is associated with a deductive reasoning. This is a simplification and there are often inductive elements in a deductive research process and vice versa (Bryman & Bell, 2011). In this particular thesis such combination is present. Existing theory was used to form the interview questions and, to some extent, the model used to answer the research questions. Therefore, deduction was also a part of the research process but if using a continuum, with deduction on one side and induction on the other, the study is more to the inductive side.

When considering which epistemological and ontological positions the authors of this thesis have taken it is basically in line with what Bryman and Bell (2011) considers to be most common in qualitative research. That is, since the thesis is founded on interviews with individuals it is important to understand that the data is subjective in nature. This means that an interpretivistic epistemological position, which understands the subjective nature, is important to take. Likewise, the ontological position constructionism, which understands that the studied reality is under constant change made by social actors, is the position which harmonizes with the study at hand.

## 3.3 Research design

The purpose of this thesis is to understand the market demand for added value products in the stainless steel industry and to explore if it is an industry fitting for servitization; the latter is

not very well researched and therefore the overall study can be said to be both descriptive and exploratory. Descriptive research is mainly done when the research aims to get a better understanding of a known topic. In this thesis the first research question is seeking to describe and understand the market demand for value-added activities in the stainless steel industry, a question which requires mapping and description. Exploratory research is the initial investigation of a new topic or investigation of a new angle on an existing topic. Servitization is a well-researched area but the authors take an angle on the topic that is not so well studied. During the initial literature review it became clear to the authors that studies who were aimed at process manufacturing companies such as Stainless Inc. were lacking in literature. This absence led to the forming of the second research question if the market demand in the stainless steel industry is in line with a turn towards servitization. Hence, the overall study type is a mix of descriptive and exploratory research.

The descriptive and exploratory nature of the research is ideal for a case study design. A case study is an up-close and in-depth examination of the subject of study, the case. The case can be anything from an organization to an individual but also an event or specific place (Bryman & Bell, 2011). A case study's main strength is specialization (Lee, Collier & Cullen, 2007) and is fitting when trying to answer "how" and "why" questions (Yin, 2003) which is what this thesis is trying to do. This thesis research design is made up of several case studies, a multiple-case study design. The cases are different market segments which Stainless Inc. uses for their business. Thus the unit of analysis is on the market segment level with intention on providing a mapping of the demand for value added activities. A drawback with case studies is their generalizability. Because of the usually very specific characteristics of a case it may be an inferior approach if the research aims to generalize findings beyond the case (Bryman & Bell, 2011). This was not a concern in this thesis since it was not a goal in this research.

### 3.4 Research methods

The main data collection method used in this research was face-to-face interviewing. In addition self-completion questionnaires (SCQs) were sent out to be able to collect data in a more efficient way. Also, secondary data from research institutes such as SMR (Steel & Metals Market Research) was collected along with economic data from Stainless Inc.´s own databases.

The reason for selecting interviews as the primary data collection method was that the authors wanted to get an in-depth understanding on how the market participants thought about the

stainless steel market. How they bought material, what they used the steel for, and what buying criteria they used, both formal and informal. These types of data were considered easiest to get hold of if doing semi-structured interviews with open questions. In a semi-structured interview a few questions are made up in advance and are discussed with the interviewee in a semi-controlled manner. The use of semi-structured interviews over unstructured interviews was considered to be the best choice since multiple case studies were carried out and to get some data which could be compared the basic questions needed to be similar. The interviews were carried out by both authors and most of the interviews were recorded so that the interviewers could focus more on the discussion and at the same time not miss important information.

Questions for the external interviews were selected based on knowledge from the literature review on strategic market analysis, section *2.1*. The questions were slightly altered depending on what type of actors that were interviewed, but the basic questions normally remained the same, for the reasons described above. An example of how an interview template could look is shown in *Appendix*.

The self-completion questionnaires were supposed to be a quick and efficient way to gather a lot of data, which is a major strength with SCQs (Bryman & Bell, 2011). The questions were meant to provide a picture on how the demand for value added products in the stainless steel industry was globally. The SCQs consisted of five questions and was sent to roughly 80 actors in the construction and wind power industry by e-mail. To get the global view of the market the recipients were geographically dispersed, mainly to North America, Europe and Asia. However, the response rate was very low (a major drawback with the method (Bryman & Bell, 2011)) so the method did not provide any useful data. The study thereafter was changed to focus more on the Swedish market so no further measures to get the data was done.

### 3.5 Sampling

The samples chosen in this study have been selected exclusively by non-probability sampling methods. A major concern with non-probability sampling is that the study may lack generalizability (Sekaran & Bougie, 2013). Due to the character of the research with focus on case studies on the Swedish stainless steel market this was not a major drawback, generalization was not the purpose. To be able to get the information needed for the study the

authors had to get in contact with experts in their given field and probability sampling methods was not deemed to ensure that the correct data was gathered.

The first step of the research process focused on establishing knowledge about the focal company and of specific interest were the different business segments. This was due to the need of getting a starting point for the investigation, and the purpose was to get a picture off which segments were interesting to investigate further. As the authors did not have prior knowledge of the focal company's organizational structure the sampling process started as snowball sampling, where first an individual with comprehensive overview of the organization (a former Vice President in this case) was selected as interview object. The major strength with snowball sampling is the ability to locate people unknown to the researchers (Bryman and Bell, 2011), which was the situation in this study.

A major disadvantage with snowball sampling is that it is not representative for the whole population (the staff in this case) and the first participant have a strong influence on the sample (Bryman and Bell, 2011). This was of minor concern at this stage since the purpose was to get contacts in the organization which was knowledgeable in the various segments and the former VP was the single person who had the broadest view of the organization. Therefore it was the only reasonable starting point. Another drawback with snowball sampling is that by targeting only a few people, it is difficult to know that all important information has been gathered (Bryman and Bell, 2011). This was somewhat mitigated by talking to more than one person in the same or similar category, this is illustrated in Table 2 where a summary of the number of internal interviewees and their position in the company is given.

**Table 2. Table of internal interviews. The left column show the number of interviewees and the right column the position held by the interviewees.**

| Number of internal interviewees | Position |
|---|---|
| 4 | Segment Manager |
| 3 | Production Manager |
| 2 | Managing Director of subsidiary |
| 1 | General Manager Marketing and Sales |
| 1 | Head of Sales |
| 1 | Product Manager |
| 1 | Business Development Manager |

The internal interviews provided a guideline for a first business segment to investigate more closely. This segment was the building and construction segment which was of interest for three reasons: First, a fragmented industry structure with many small actors may facilitate market entry. Also, an industry with limited knowledge of how to build/work with stainless steel, a field where Stainless Inc.´s excels, opens up for knowledge based services. Finally, it is a project-based industry which may facilitate experimentation. This segment was broken into two sub segments: infrastructure and water gates, due to their different characteristics. Another important insight from the internal interviews was that a big part of the thick plate was sold through distributors. This insight led to an investigation of those actors as well. From interviews with two different major distributors in the Swedish market two more segments was selected for further investigation. These were the water treatment (an upcoming and growing market) and the pulp and paper segments (largest share of the distributor's stainless thick plate sales). These four segments were studied and key actors on the Swedish market were mapped. After key actors had been identified an expert sampling technique was used to choose subjects for external interviews. The "experts" within each segment was sought out through contacting the companies and asking for people with the right knowledge. One weakness with this approach is that even experts within a given field is not always right (although most qualitative questions do not have a right or wrong to begin with), to mitigate this weakness at least two individuals were interviewed at every level of the supply chain (see *Empirical Findings* for supply chain illustrations). Table 3 to 6 shows a summary of all interviewees that have been interviewed for this thesis. The tables show where in the supply chain the interviewees belong and also which position they hold.

**Table 3. Table of interviews in the infrastructure and the water gates segments. The left column shows type of actor in the supply chain and the right column shows the position held by interviewee.**

| Type of actor (infrastructure & water gates) | Position |
|---|---|
| Project Owner | Bridge specialist, Steel Bridge Engineer |
| Consulting Engineer | Area Manager bridge engineering |
| Consulting Engineer | Team Manager Infrastructure |
| Consulting Engineer | Professor in bridge construction |
| General Contractor | Product Manager and purchaser steel |
| General Contractor | Site Manager |
| Subcontractor | Sales Manager |

| | |
|---|---|
| Subcontractor | Workshop Director |

**Table 4. Table of interviews in the water treatment segment. The left column shows type of actor in the supply chain and the right column shows the position held by the interviewee.**

| Type of actor (water treatment) | Position |
|---|---|
| Contracting company | Workshop Director |
| Contracting company | Director Project Department |
| Contracting company | Owner/Project Manager |
| Subcontractor | Workshop Director |
| Subcontractor | Workshop Director |

**Table 5. Table of interviews in the pulp & paper segment. The left column shows type of actor in the supply chain and the right column shows the position held by the interviewee.**

| Type of actor (pulp & paper) | Position |
|---|---|
| OEM | Purchaser |
| OEM | Site Manager |
| Subcontractor | Workshop Director |
| Subcontractor | Workshop Director |

**Table 6. Table of interviews of distributors. The left column shows type of actor in the supply chain and the right column shows the position held by interviewee.**

| Type of actor (distributors) | Position |
|---|---|
| Distributor | Sales Manager |
| Distributor | Product Manager Stainless |

During the research process two other market segments were considered for further investigation, the oil and gas segment as well as the energy segment. Oil and gas is a segment where large volumes of thick plate are used, but this segment was not chosen mainly for two reasons: First, the segment has numerous established tube manufacturers, which buy thick plates and turn them into tubes and pipes. This is one of the major value adding activities in this segment and it is hard for a steel producer to compete in that market. Second, further down the value stream, at project management level, there are large companies with excellent knowledge of the industry and of working with stainless steel, thereby it was deemed difficult to offer services there. The energy segment (in which nuclear power is the major part) was

initially investigated but due to difficulties getting any relevant information it was abandoned. The reason behind the difficulty gathering data was that the contacted actors in the nuclear sector were not willing to share information (due to secrecy).

As for the sampling of the questionnaires, a simple method was used. A list of the hundred largest (measured by revenue) construction companies and the twenty largest wind power companies was retrieved from the Internet. The questionnaires were then sent to all companies possible (a few was missing contact possibilities or had complicated online-forms). As stated above the response rate was low and the data received was not deemed reliable enough to use.

### 3.6 Data analysis

As stated above the study has a qualitative nature and the data analysis is therefore also of qualitative kind. The analysis process was done roughly in a step-wise manner and included the following activities:

- Data collection and documentation
- Organization of data
- Examination of relationships and data display
- Conclusion drawing
- Report findings

The data collection and documentation was done by interviewing, recording, and transcribing the interviews.

The interviews were semi-structured which meant that most of the questions asked was the same for each interviewee. There were some slight variations between the segments to better match the industry and some additional questions in some cases that came naturally during the interviews. The fact that the majority of the questions were of the same kind facilitated the organization of the data. Tables were created that summarized the important questions in an easily overviewed way.

The first research question (RQ1) and its first sub-question are entirely descriptive and therefore the data analysis technique used to address those questions was similar to a case-oriented understanding method. A method which is used to understand a case from the participant's standpoints and accurately reflect these views (Bryman & Bell, 2011). The data from the interviews was used to create segment maps and to describe the characteristics of the

demand. These are presented in the *Empirical Findings* chapter. To answer the second sub-question of RQ1 the conceptual framework presented in the *Literature Review* chapter was used. The data gathered from the interviews was fitted into the framework and conclusions drawn.

The output from RQ1 was used as input to answer the second research question (RQ2). After evaluating the chosen segments the conclusions from each segment was used to draw inferences of the Swedish stainless steel market potential for servitization.

### 3.7 Quality measures

There is a variety of different quality criteria used to evaluate business research. The most common is reliability, replication and validity. These criteria, or at least reliability and validity, are often associated with quantitative research and there are continuously discussions on whether or not these are good criteria to evaluate the quality of qualitative research (Bryman & Bell, 2011). The discussions have led to two types of outcomes: modifications of reliability and validity to better fit qualitative studies (LeCompte & Goetz, 1982), and the emergence of different criteria focused on qualitative research (Lincoln & Guba, 1985; Yardley, 2000). Lincoln and Guba (1985) came up with two criteria: trustworthiness and authenticity which is founded on the presence of different views in a social setting, which is a major concern in qualitative research. Thus, these criteria are suitable to evaluate a research like this, which is founded mainly on qualitative interviews. On the contrary, authenticity have not been wider adopted or prominent (Bryman & Bell, 2011), and have consequently been left out. Trustworthiness is made up of four different criteria: creditability, transferability, dependability, and confirmability.

The creditability criterion is concerned with whether or not the researcher interprets the collected data as it is expressed by the interviewee (Bryman & Bell, 2011). Put in another way, do the researchers interpret the interviewees' answers in a correct way? This is important in this thesis since it is almost entirely based on interviews as data collection method. The authors did four things to address this issue: during the interviews when something was not entirely understood, the interviewer repeated the answer as interpreted and sought confirmation from the interviewee to ensure correct understanding. Secondly, if the understanding of a concept was vague during the transcription of the interviews an additional contact was sought with the interviewee (phone or e-mail) to clarify the vagueness. Thirdly, after the interview the recording was transcribed by one interviewer and the transcript was

later counterchecked against the recording by the other interviewer. This was done to ensure that the correct data was read out of the interview. Finally, related to the later, the segment maps constructed was shown for the interviewees for confirmation on their accuracy (respondent validation). These four actions were deemed to dramatically reduce interpretation errors and ensure a credible study.

The transferability of a study refers to if the researchers have delivered enough comprehensive information so that knowledge is transferable to other social contexts (Bryman & Bell, 2011). Is it possible (or easy) to use the results for a similar study in another environment? If this criterion is achieved is certainly for the reader to judge but the authors have tried to provide as transparent and comprehensive information as possible. Even if the information given is enough to transfer knowledge to another environment this study was conducted in a very specific environment and the generalizability can be difficult to predict. The research design was a multiple-case study which focused on a few business segments on the Swedish stainless steel market. Therefore, to be able to generalize the study a comparison on factors such as culture, industry structure and institutions have to be made to try to find environments similar to Sweden.

Dependability is closely related to reliability. The criterion focuses on if the researcher keeps records of data so that the study can be assessed afterwards (Bryman & Bell, 2011). This is a criterion that may be difficult to follow when performing applied case study research with a private company as sponsor. To illustrate, in this thesis the authors had to sign a confidentiality agreement to not reveal information and to keep the sponsor anonymous. Therefore, even if data attained is kept it cannot be disclosed. However this does only apply to sensible company data and other important data is recorded, kept, and open for auditing.
Finally, the confirmability criterion is about objectivity, both of the researcher and the study itself (Bryman & Bell, 2011). Which actions have the researcher taken to ensure an as objective study as possible? This can be complicated in a qualitative study based on face-to-face interviews as the interviewer can influence the interviewee (e.g. anchoring) and affect their responses. The authors mitigated this by formulating as many non-leading questions as possible. The questions were of a more open nature. If more direct questions on a topic were asked these were asked at the end of the interview to avoid anchoring the interviewee. It is almost impossible to guarantee a hundred percent objective study when dealing with social actors but the authors tried to be guided by data and not by general opinions of involved actors.

To summarize, the authors consider the study credible, confirmable, and to some extent transferable (not generalizable without further investigations) but weaker in the dependability criterion. The latter mainly due to nondisclosure agreements.

# 4. Empirical findings

This chapter covers the information that was generated from the data gathering phase of the project. Firstly, there will be an introduction to the stainless steel industry followed by a description of the main challenges that the steel producers face today. Lastly, and as the main part, there will be a description of the investigated segments. The segment description is mainly based on data from the conducted interviews while the first two parts are based mainly on secondary data from industry sources.

## 4.1 Background to stainless steel industry

Stainless steel was first used in the beginning of the 20$^{th}$ century, and has since then become an established feature of 21$^{st}$ century living, being an essential component in products we use daily as well as in buildings and industry equipment. Stainless steel is a type of steel, which has a chromium content of at least 11 percent. This feature gives the material a shiny gloss and the property of being corrosion resistant, the latter being the main difference between carbon and stainless steel, making it useful in a wide range of applications. Examples of applications where stainless steel is used today include kitchen equipment such as sinks and cutlery, industrial components such as engine parts and chemical tankers as well as building and construction applications like building facades and structural parts in infrastructure constructions (ISSF, 2015).

During 2013 global stainless steel demand reached 34,941 kilotonnes (1,000 metric tonnes), divided into the different applications as shown in Figure 4 (SMR, 2014). This volume can be compared to the volume of carbon steel during this period, which was 1,539,000 kilotonnes (Marketline, 2014), i.e. stainless steel usage corresponds to 2.3 percent of carbon steel usage worldwide. Stainless steel is a steadily growing market with an average growth of 5.32 percent since 1980. This number makes it the fastest growing material compared to other metals. Carbon steel over the same period has had an annual growth of 2.35 percent (ISSF, 2014).

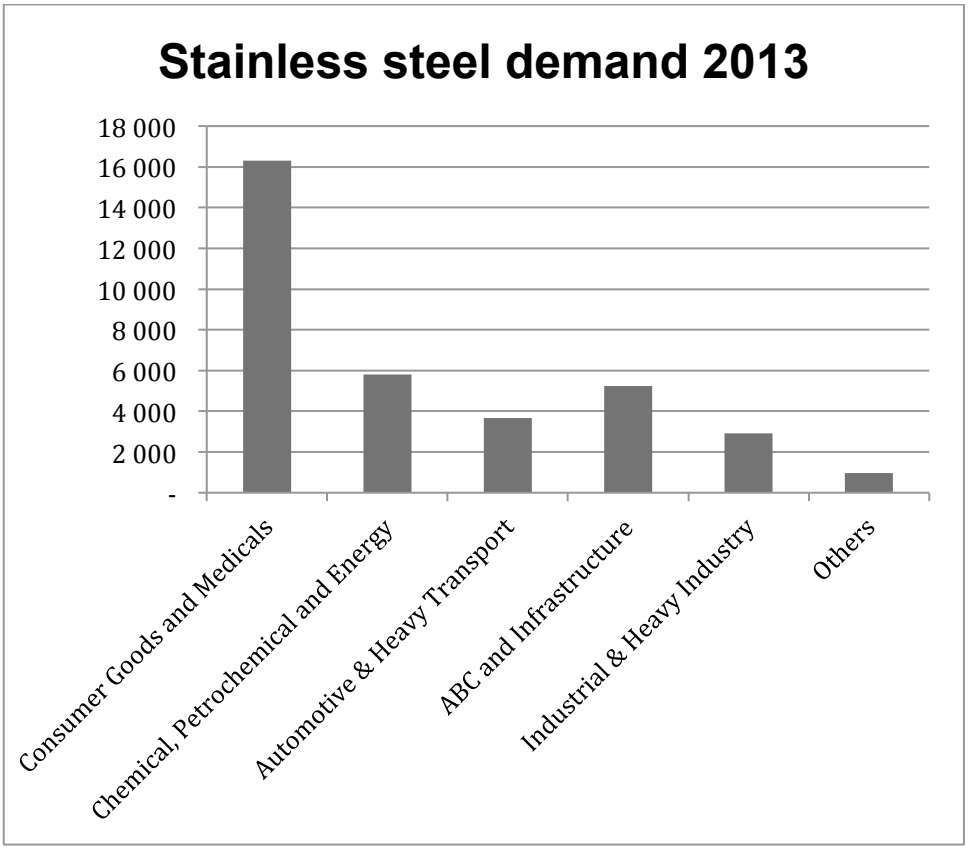


**Figure 4. Stainless steel demand in kilotonnes by market segment during 2013. Source: SMR (2014).**

Stainless steel products can be divided into different grades based on their chemical compositions, which make them suitable for different applications. More specifically, the chromium content can be varied between grades, as well as the nickel and molybdenum content for example. The main families of grades are austenitic, ferritic, martensitic and duplex grades (Outokumpu, 2013).

Normally, stainless steel is also divided into three different types of products: coil, long products and thick plate. The coil family is mainly used for consumer goods, but also in different types of industry applications. It is the largest family of stainless steel if ranked by usage, as it stands for more than 70 percent of the total stainless steel demand in 2013. Long products include products such rods, bars, tubes etc. They are mainly used for heavy industry but also to some degree for consumer goods. Lastly, the thick plate family consists of plates with a thickness of more than 6 mm. This product will be the focus of this thesis, and its usage in different applications can be seen in Figure 5 (SMR, 2014).

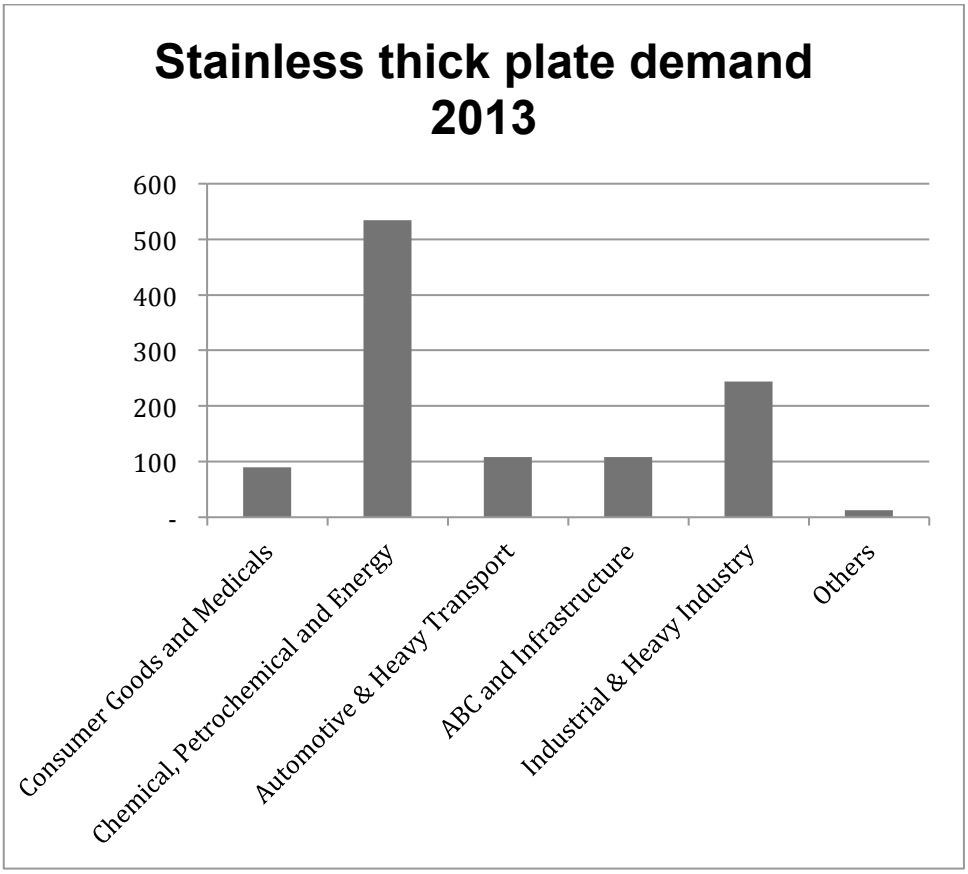


**Figure 5. Thick plate demand in kilotonnes by market segment during 2013. Source: SMR (2014).**

As shown in Figure 5, the usage of thick plate for consumer goods is limited. Rather, this product's predominant usage is within the energy segment. The total global demand during 2013 reached 1,097 kilotonnes, and thus thick plate represents only a small part, around 3 percent, of the total stainless steel market. Asia, and especially China, is the largest region by a wide margin, representing 59 percent of the total demand of stainless thick plate. Europe represents around 14 percent of global demand, whereas the Swedish market stands for 14 kilotonnes, or just below 9 percent of total European demand. The global thick plate industry is forecasted to grow with more than 5 percent annually until 2017 (SMR, 2014).

## 4.2 Challenges within the stainless steel industry

Though a growing market, the stainless steel industry presents numerous challenges which have seen, especially European, producers struggle to produce anything other than red numbers in the financial statements during latter years. The main challenges for European stainless steel producers are presented below:

- **Growing competition from Chinese producers**

  As shown, the market for stainless steel has grown over the last years. However, since the year 2000, one country has been solely responsible for that growth – China. While

North America and Europe had zero growth between 2000 and 2010, the Chinese market grew 34 percent and the rest of Asia 2 percent (ISSF, 2012). These markets are tough to reach for European producers, who usually have higher fixed costs than their Chinese counterparts. At the same time, Asian producers have also increased their sales on the European market, 27 percent more Asian material was sold on the European market in 2013 compared to 2012. All in all, Chinese manufacturers produced 50 percent of the world's stainless steel in 2013, compared to 13 percent in 2005 (ISSF, 2014).

- **Over-capacity at stainless steel mills**

  Many stainless steel producers decided to make investments in production capacity just before the market took a downturn during the global financial crisis starting in 2008. The effect of this can still be felt on the market today. Since the financial crisis started, the utilisation ratio at the mills has been below 70 percent, with a global over-capacity of production between 8,500 and 11,500 kilotonnes during the years 2008-2013 (ISSF, 2012). The result of the over-capacity has become higher fixed costs for the companies as well as an increased price pressure due to the increased supply.

- **Prices and volatility of raw material have increased**

  The stainless steel producers are reliant on raw material prices for their production. Since 2000, the prices of important raw materials have gone up. Carbon steel scrap has become four times more expensive, while nickel and chromium have become 2.5 times more expensive. At the same time, the volatility of the prices has increased significantly and especially the price of nickel has varied a lot during recent years (ISSF, 2012).

## 4.3 Segment descriptions

In this part, the data gathered from the investigated segments will be presented. As described in section *1.1,* Stainless Inc.'s thick plate unit produces products aimed at several different market segments. However, only four of those, *Infrastructure, Water Gates, Water Treatment* and *Pulp & Paper* will be expanded upon here. The reasons for choosing these segments are discussed in section *3.5*. A sole subsection, *4.3.5,* will also be dedicated to the actor type distributors, since they are present in similar roles within all market segments.

### 4.3.1 Infrastructure

The infrastructure segment includes applications such as bridges and tunnels. Stainless steel is not yet established as a material within the construction segment in Sweden or the rest of Europe. For Sweden, the main potential within the segment is within bridge constructions, as tunnels were not considered a significant application by any of the interviewees. The bridge application includes all types of bridges such as road, railway and pedestrian bridges. Since bridges normally are expected to have long life spans, stainless steel may be an alternative that offers a lower life cycle cost due to the maintenance-free nature of the material, especially in environments where corrosion-resistance is required, such as locations closely connected to water.

Even for bridges though, the usage of stainless steel is currently limited in Sweden. Trafikverket, which is the dominating project owner within the segment, has yet to build a single bridge in stainless steel. However, there have been cases where stainless steel has been used when the project owner is someone else than Trafikverket, but it seems rare for these types of projects as well. Trafikverket estimates its annual consumption of carbon steel for bridges in Sweden to 3,500 tonnes, even though single projects spanning several years can comprise more than 10,000 tonnes of carbon steel. Coupled with the consumption coming from other project owners the total Swedish consumption of carbon steel is estimated to 5,000 tonnes annually, which would roughly correspond to the long-term regional potential for stainless steel within the segment. Of these, the 1,500 tonnes consumed by non-Trafikverket project owners would be easier to reach, while the 3,500 tonnes consumed by Trafikverket would require them to change their standard specifications.

The actors with incentives for switching to stainless steel in bridge constructions are the stainless steel producers, like Stainless Inc., and the project owner. Other actors, such as consulting engineers and construction companies have no real incentives. Trafikverket is currently working on life cycle assessments but they would need more data for this in order to reach any new conclusions.

#### *4.3.1.1 Actors in the infrastructure segment*

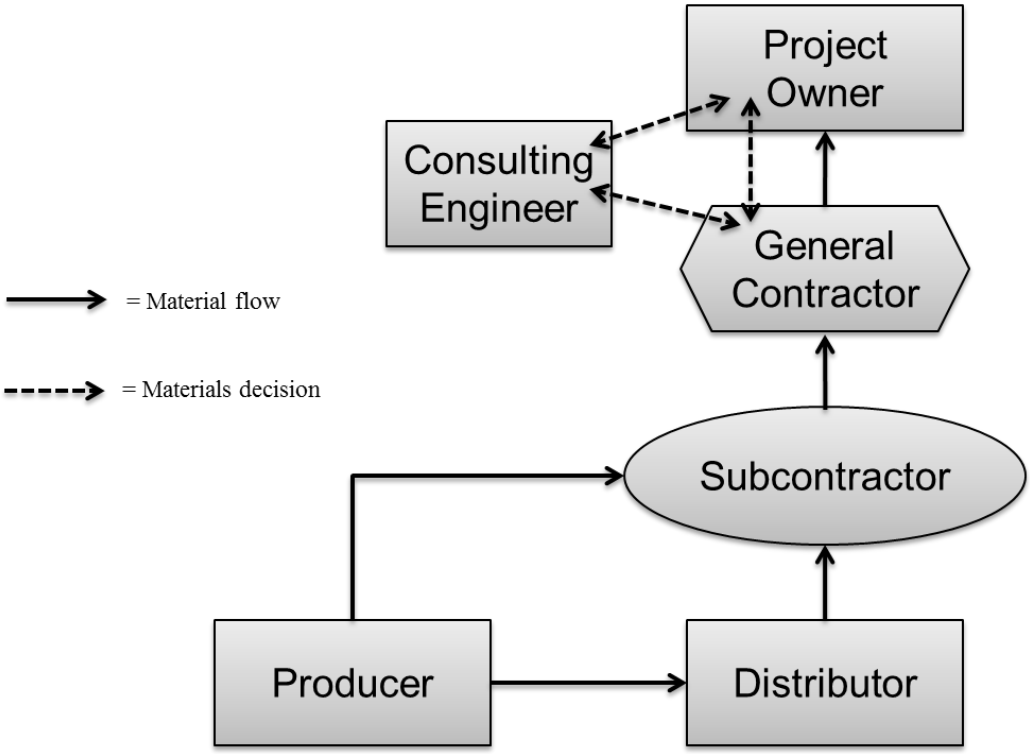


**Figure 6. Supply chain for the Swedish infrastructure market.**

Figure 6 shows the supply chain in the infrastructure segment. The solid arrows indicate the way of the stainless steel plates from the producer to the end customer and the dotted arrows shows the materials decision process. As mentioned, stainless steel is not an established material in the industry but a supply chain has still been created, which represent a normal bridge construction project in Sweden. The roles for the actors as described below can be assumed to be similar independent of the material being carbon or stainless steel.

***Project owner:*** This actor is usually a governmental institution. For the most part this would be Trafikverket when the applications are bridges. For smaller bridges, such as many pedestrian bridges, it may often be municipalities who are the project owner, or in some rare cases even private actors. Normally, the project owner will present a project that they are requesting, with some essential specifications that need to be met by their suppliers. Interested suppliers thereafter send in their offers from which the project owner chooses. In some cases, the project owner will choose to involve both a consulting engineer and a general contractor, whereas in some cases they will only contact the general contractor. In any case, the specifications determined by the project owner may or may not concern the material decisions, i.e. if stainless or carbon steel should be used for example. However, even in those cases where the material is not specified, the project owner will rarely be able to choose a proposal where stainless steel is used because of the fact that it is more expensive than carbon

steel and the characteristics of the project owner make this a public procurement, which is bound to be decided by price.

This part of the segment can be considered to be fairly concentrated, where Trafikverket owns the majority of the projects, at least in terms of volumes of steel. However, there are a few private actors present on the market as well but they usually only handles smaller projects so if significant volumes were to be reached within this segment, Trafikverket is the part that needs to be persuaded.

***Consulting Engineer:*** This actor is normally a technical consultant company. They act as an advisor to their customer, and depending on the project, this actor can be hired in different stages of the process. Sometimes their customer will be the general contractor and sometimes the project owner. The services that the consulting engineers perform may include design, life cycle analysis, and planning with various levels of detail. Their degree of involvement depends on the decision taken by their customer. In theory, the consulting engineer could be involved in material choices but, as mentioned, they would not win many orders by proposing stainless steel and they do not have any real incentives for it either.

There are a few large, private actors in this tier that dominate the Swedish market. Some smaller actors are present as well but when it comes to the larger projects, these are rarely contracted. Many of the consulting engineers have not been involved in bridge projects with stainless steel and thus, their experience with the material is limited. Therefore, not only do they lack incentives to propose stainless steel as material, they may actually have incentives for not proposing it.

***General Contractor:*** The general contractor would normally be a construction company. Like for the consulting engineer, their role will differ depending on the choices made by the project owner. When the project owner decides to hire only the general contractor and not a consulting engineer, the general contractor may themselves perform the services that are usually performed by the consultant. Larger construction companies normally have a business unit which can manage these services, whereas smaller companies usually hire a consulting engineer. Apart from this, the general contractor is the part responsible for putting together the project, i.e. delivering the finished bridge to the project owner.

Similarly to the consulting engineers, this tier is dominated by a few large companies, who get contracted for most of the larger projects. Like the engineers, general contractors lack

incentives to propose stainless steel as material, and are also unexperienced in working with stainless steel in bridge constructions.

***Subcontractor:*** The subcontractors are hired by the general contractor. What type of subcontractor it is varies widely depending on what operations the general contractor performs in-house. Sometimes the subcontractor may supply the general contractor with steel plates, whereas sometimes they supply them with more high-end components. Normally in infrastructure projects, there is at least one step between the general contractor and the steel plate supplier, i.e. the subcontractor hired by the general contractor will rarely deliver simple plates but rather more refined material or components.

The tier consists of a large number of small to medium-sized firms who do business within a number of segments, i.e. they are normally not limited to the construction segment. Because of the typically low volumes of stainless steel in the projects subcontractors prefer to buy from distributors rather than from the steel producers, who are usually not able to offer a keen price on low volumes. Subcontractors find value in the broad assortments and good delivery time and precision that the distributors are perceived to offer.

***Distributor:*** The distributor has a similar role in all segments and will be described more thoroughly in its own section.

***Producer:*** The actor who produces the steel, e.g. Stainless Inc.

#### *4.3.1.2 Value adding activities in infrastructure*

Distributors add value by offering a logistical solution where the customer can buy material packages from a wide assortment in an off-the-shelf manner. This is the usual channel used by the subcontractors who demands the plates and other materials. However, if stainless steel plates are required in large volumes, subcontractors may buy directly from producers, if the price they can offer is lower.

Further down in the value chain, subcontractors add value by offering services such as assembly and installation of components at site. Also, they manufacture components such as beams and larger construction parts for the bridge from the steel plates.

Consulting engineers are normally involved early on in projects and offer value adding services such as design, calculation, and specification, while general contractors do most of the other project management related services such as procurement and managing the

subcontractors. For stainless steel, the engineering capabilities on the market may be somewhat lacking, since engineers are inexperienced with the material.

### 4.4.2 Water gates

In this text water gates or the water gate segment refers to basically two applications. Firstly, in the hydropower industry, dams and reservoirs are built to even out seasonal changes in the water flow. A water gate is then used to control the flow of water from the dam or reservoir. Secondly, water gates (may also be called lock gates or sluice gates) are used in channels to close of the water flow to be able to raise the level of the water (also called a lock).

In both applications there are two situations when there is a demand for a new water gate. Either there are new constructions (hydropower plants or locks) or there is a need to change old water gates. On the Swedish market, the hydropower industry is not expanding so the demand for new water gates in this sector comes exclusively from the need of changing old water gates.

The use of stainless steel plates to make water gates for the hydropower industry is a recent development. Basically all old water gates are made of carbon steel which has been coated with rust preventive paint. This is partly due to that the upfront cost for such a solution is lower than to buy a stainless gate. Lately, companies have begun to calculate lifecycle costs which are thought to be lower with stainless steel due to it being maintenance free. The old water gates that are being replaced by stainless steel gates are usually small, 6x3 meters (width x height), and weighs roughly 6 to 7 tonnes. Old larger water gates are normally being repaired instead of replaced this due to the large costs involved. However, there are examples of larger gates, with steel volumes up to 20 tonnes, being changed into stainless steel as well and this is a development that producers are pushing for to increase.

In Sweden, roughly 125 to 170 smaller water gates to the hydropower industry are changed or newly constructed every year. With an average weight of 6 tonnes this adds up to between 750 and 1,000 tonnes of stainless thick plate each year. This sector constitutes the overwhelming part of the whole demand as water gates for locks and channels only contribute with a couple of gates annually in Sweden. Therefore, the market size for water gates in Sweden has been estimated to be the same amount, 750 to 1,000 tonnes stainless thick plate annually. Due to large investments in restoration of Swedish hydropower, this number is expected to grow the coming years.

Currently, Stainless Inc. are only involved in the water gate segment on the Swedish market. On the European market, the potential market size has been estimated to as much as 8,000 tonnes per year based on hydropower generation in European countries (Eurelectric, 2011).

#### *4.4.2.1 Actors in the water gate segment*

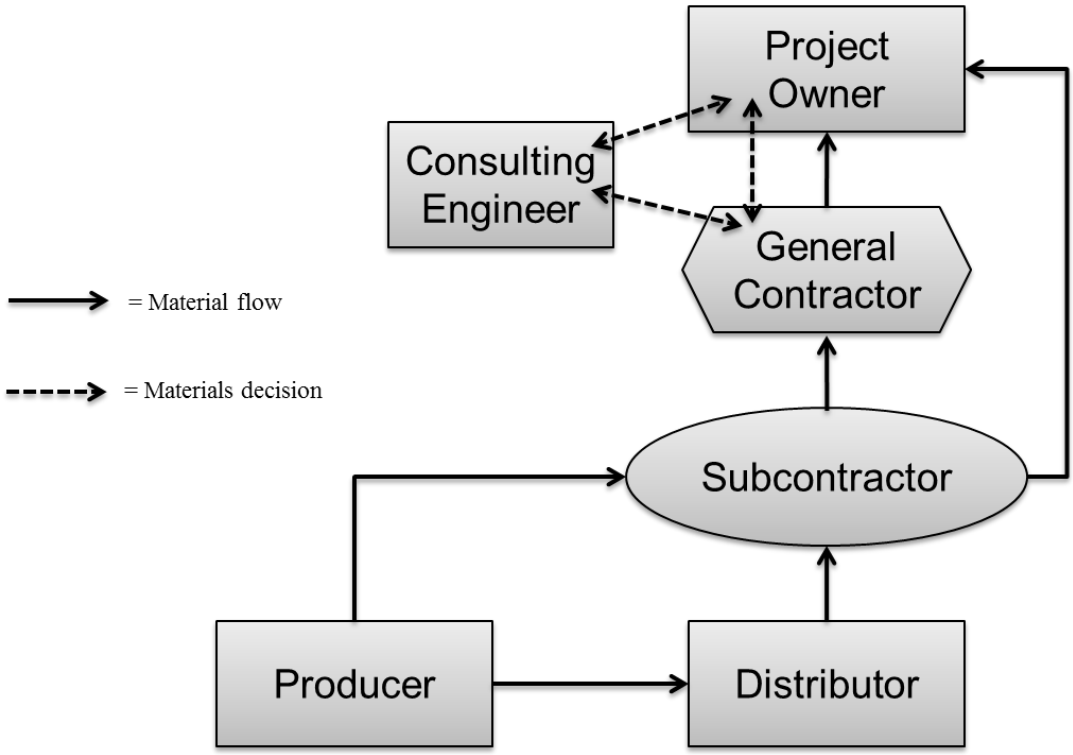


**Figure 7. Supply chain in the water gates sub segment.**

Figure 7 shows the supply chain for the water gate application. The solid arrows indicate the way of the stainless steel plates from the producer to the end customer and the dotted arrows shows the materials decision process.

***Project Owner:*** In the Swedish hydropower industry the project owner is a power company. Typical actors are Vattenfall, who is owned by the Swedish government, as well as large nationwide private actors such as E.ON and Fortum but there are also some small local energy companies. They own the hydropower plant and initiate the process of changing water gates. The project owner makes a technical specification of the water gate and sends the specification to a number of contractors. The contractors make quotations and the project owner chooses which contractor to use. When there are small jobs the project owner usually goes directly to a subcontractor such as a metal workshop with the job offer. In larger projects which involve more than just changing water gates, a general contractor usually acts as a project manager. In the case when Vattenfall is the project owner the Swedish rules of public

procurement may apply (depending on the size of the job) which means that the project plan must be open for all to bid on.

When it comes to locks and other channel gates it is (in Sweden) common for the municipality to be the project owner. For example in Gothenburg this may be *Trafikkontoret*, a local authority. These types of jobs are also done by public procurement. Another example is the Netherlands where the responsibility for the waterways is the governmental actor, the *Rijkswaterstaat* (responsible for Public Works and Water Management).

***General Contractor:*** This actor is generally a construction company such as Skanska or NCC. As mentioned above this actor is mostly involved in new constructions and large renovations. In these projects they have the same function as in an infrastructure project. That is, project management, procurement and coordination.

***Consulting Engineer:*** Same function as in an infrastructure project and is, similarly to the general contractor, mostly involved in larger projects.

***Subcontractor:*** This actor can range from a small local metal workshop to a medium sized maintenance company. The subcontractor buys material from either a distributor or directly from a producer and prepares the water gate for installation which can include activities such as welding and bending. The Swedish market is made up of roughly 15 to 25 firms in this tier, a number that has increased during latter years as the segment itself has grown.

***Distributor:*** The distributor has the same role as in the other segments. Considering the small amounts of volume per project, about 6 tonnes per gate, the distributor channel plays a major role in this segment as most projects use this channel.

***Producer:*** The producer of the steel, e.g. Stainless Inc.

#### *4.4.2.2 Value adding activities related to water gates*

Like in the infrastructure segment, distributors add value through logistics solutions that they offer to especially the subcontractor. The subcontractor normally works in direct relation with the project owner as they assemble and install the water gate at the site of the hydropower plant.

Stainless Inc. currently have an established offering, where they work in close collaboration with subcontractors to offer water gates to the general contractors or project owners. Stainless Inc.'s role in the projects is to deliver tailor-made material to the subcontractor, ready for

installation at the site, which is then done by the subcontractor. This has been shown to be a lucrative offering with approximately four times higher margins than on the usual thick plates that Stainless Inc. sell. The offering is currently limited to the Swedish market, where Stainless Inc. is the only actor doing this. However, the major part of the segment still goes through the distributor channel where margins remain low.

Added services such as engineering which are fundamental in the infrastructure segment play a smaller role when it comes to water gates. Usually, specifications are set by the project owner and the subcontractor design the gate to meet specifications. Normally, no consulting engineers are required to be part of the chain for these small types of water gates that are the major part of the segment.

#### 4.3.3 Water treatment

The water treatment segment mentioned in this text includes water treatment, wastewater treatment, and to some extent, biogas plants (actors within the industry usually build biogas plants in addition to water and wastewater plants). When, and if, important it will be specified which branch is in focus of the discussion.

In a water treatment plant subsoil or surface water is purified into drinking water. In the treatment process precipitation chemicals, chlorine, and other chemicals is used which put demand on the resistance of the material used in the plants. The water itself and the humid environment make a hotbed for corrosion and therefore stainless steel is used in many applications in the plant. For example, sedimentation basins, sludge scrapers, plumbing, and tanks.

In a wastewater treatment plant, the water is purified before being released out into nature. A common method is a three step treatment: mechanical, biological, and chemical purification. As in the case with water treatment plants, chemicals and moist makes stainless steel a good material to use for fabrication.

The market size for the whole Swedish water treatment construction market (including wastewater treatment and biogas) is roughly in the order of 1,500 million SEK. The total use of stainless steel thick plates on the Swedish water treatment market is somewhere in the range of 2,500 to 3,750 tonnes per year. The main applications for stainless steel plates in this industry are water tanks, containers, sludge scrapers and pressure vessels.

The market is growing. A big part is due to municipal wastewater plants that need to be replaced as a result of age and wear. Most part of the projects is renovation and rebuilding of old plants. Completely new plants are rarer, especially when it comes to bigger plants.

#### *4.3.3.1 Actors in water treatment*

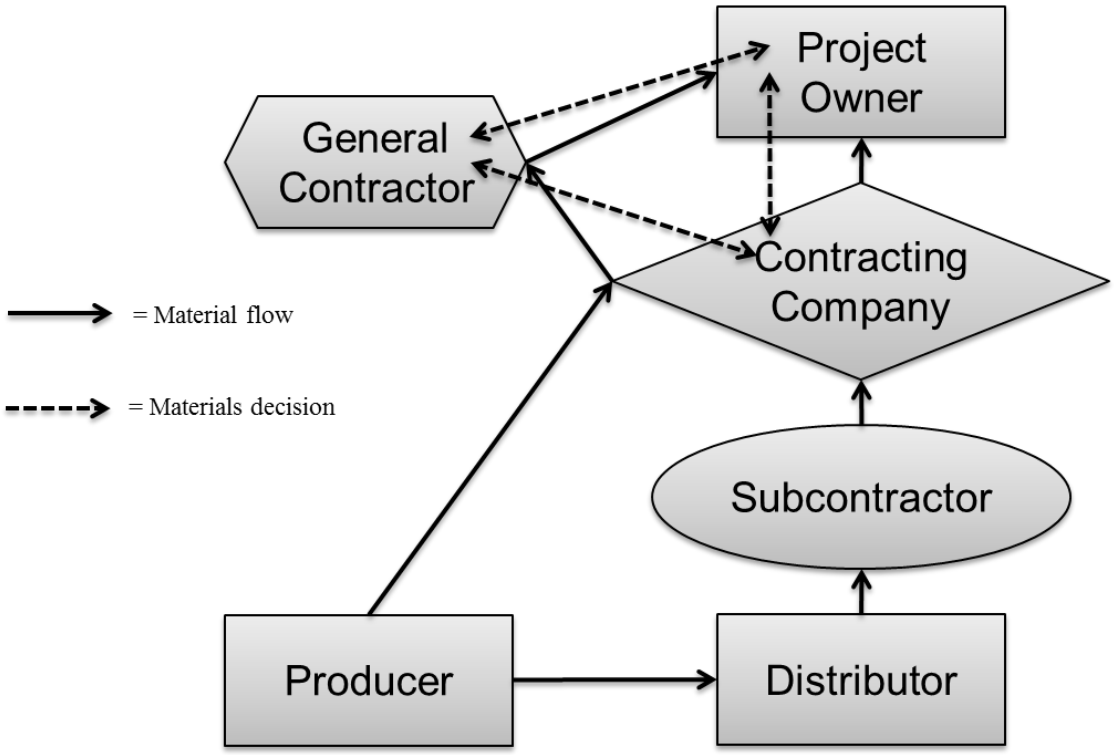


**Figure 8. Supply chain in the water treatment industry.**

Figure 8 shows the supply chain in water treatment industry. The solid arrows indicate the way of the stainless steel plates from the producer to the end customer and the dotted arrows shows the materials decision process.

***Project Owner:*** This actor is the one who orders and pays for the finalized plant. In Sweden, water treatment is a public concern and therefore the project owner is basically always a communal actor such as *Stockholms stad* or another municipality. When it comes to wastewater treatment and biogas plants there is a mix of public, industrial, and private project owners. Generally, the procedure to purchase a plant is as follows: the project owner has a need (for example a water treatment plant for 2,000 people). This need is specified, documented and either sent to a number of actors for price proposals or made public available so that interested firms can make a bid (procurement procedures, usually the case with public actors). The project owner is (in most cases) not involved in the material decision.

***Contracting Company:*** In the water treatment segment there are a couple of different types of contracting companies. There are those who deals mostly with design, project planning, and purchasing (e.g. Purac and Emendo) and functions like a project manager. They make drawings, buy the components of the plants and hire external firms to assemble and install the plants. In this case of components such as water tanks and containers the contracting company sets the quality requirements of the material but does usually not decide where or from whom to buy the material, this is up to the supplier of the components (metal workshops). In the case of components like pumps, consoles and sludge scrapers the contracting company usually orders directly from a distributor or supplier, and therefore determines material type themselves. Another type of contracting company does also function as a project manager but in addition builds its own components in a company owned (can be a subsidiary) workshop. Containers and water tanks are made in-house while other components such as plumbing, consoles, and pumps are bought from a supplier. This type of contractor (e.g. Malmberg Water) has control over all material decisions in the plant. In all cases the contracting company is contracted by the project owner to carry out the given project. In Sweden, two to four large companies dominate the big projects, holding 80 to 90 percent of the market, while there are roughly 20 smaller firms who work with smaller projects.

***General Contractor:*** A general contractor may also from time to time act as a project manager in this industry. The general contractor accounts for the whole plant and assembles the buildings, do the ground work, and in some cases install the purification part. In this case the general contractor procure services from the water treatment companies which then functions as described above (but is now a subcontractor instead of contracting company). Typical actors in Sweden include Skanska and Peab.

***Subcontractor:*** A subcontractor is a business or person that carries out work for a company as part of a larger project and can be anything from an electrical installation firm to a concrete firm. As this report focus on stainless steel, a subcontractor here is a firm or person which carries out work in stainless steel, for example a metal workshop. The subcontractor gets a contract from the contracting company (usually by tender) to deliver something to the project (e.g. to the wastewater treatment plant). As long as the subcontractor deliver the agreed product in the agreed quality he (or she or it) is usually free to choose where they want to purchase their input material. The material may come from (and usually does) a distributor or in some cases directly from the producer. In his particularly industry examples of components that are constructed by metal workshops are water tanks and containers.

On the same level as the subcontractors there are also suppliers. This actor manufactures and delivers components such as pumps, sludge scrapers, and other equipment which is used to finalize the plants. Their input material is bought either from the distributor or in rare cases from the producer. This actor is not shown in Figure 8 as it has the same function as subcontractor in this context and was not of further interest to illustrate explicitly.

***Distributor:*** The distributor buys material from producers and resells it directly to the end-user or customer.

***Producer:*** The producer is the actor who manufactures the stainless steel plates (e.g. Stainless Inc.).

#### *4.3.3.2 Value adding activities in water treatment*

The distributor buys stainless steel plates (usually standard dimensions) from the producer. The distributor then adds value to the product by activities such as: repacking, stockholding and logistics solutions. The distributor buys in large quantities and can thereby get better prices than individual buyers.

Subcontractors such as metal workshops buy the plates from the distributor. It happens from time to time that metal workshops buy directly from a producer. This may be the case if the job requires large quantities of steel so that the workshop gets discount (or reaches the minimum order requirements) from the producer. The subcontractor then adds value by cutting, bending, and welding the plate into products such as water tanks, pressure vessels and containers.

Finally the contracting company (and/or subcontractor depending on the project) assembles the various parts needed into a finished plant.

In addition, between each main actor value is added through transport by train, trucks and/or ships. This is done either by the distributor, logistics companies (ADL, Schenker), or the subcontractor.

### 4.3.4 Pulp and paper

The pulp and paper industry consists of companies that are involved in the processing of wood into pulp, paper, board, tissue and other cellulose-based products, and/or in bringing these products to the market. The processing is done in large paper mills, preferable located adjacent to good infrastructure and abundant raw materials. The industry is primarily based in North America, Northern Europe and East Asia. It is a fragmented market where the four

major actors account for less than 8 percent of the total market share (Marketline, 2012). Major actors in the industry are for example International Paper Company from USA and Stora Enso from Finland, both big producers and traders of pulp and paper products. Examples of applications for the finished products are newsprint, waste paper, as well as printing and writing paper (Marketline, 2012).

A report from MarketLine (2012) indicates that the market outsights over the coming years are positive with an expected growth of 5.8 percent for 2015 and 7.1 percent for 2016. This is in line with the recent year's growth numbers (CAGR of 6.2 percent between 2011 and 2014). The environments in which the pulp and paper products are made are a highly corrosive environment and consequently the use of stainless steel is standard in the business. In a paper mill, components which include stainless steel are for example: suction roll shells, pressure vessels, fiber units, and liquor tanks.

Every year the market for paper mills accounts for roughly 16,800 to 25,500 tonnes of stainless thick plate globally.

#### *4.3.4.1 Actors in pulp and paper*

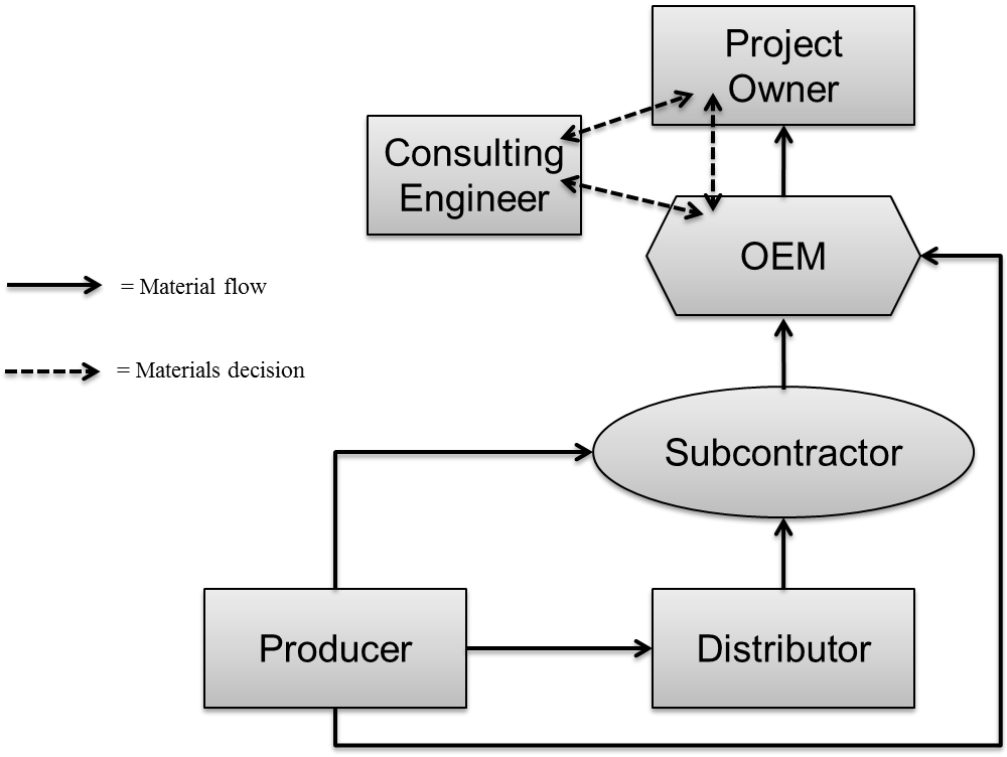


**Figure 9. Supply chain in the pulp and paper industry.**

Figure 9 shows the supply chain in the pulp and paper industry. The solid arrows indicate the way of the stainless steel plates from the producer to the end customer and the dotted arrows shows the materials decision process.

***Project owner:*** This actor is one of the large paper companies such as Stora Enso and International Paper Company. At this level there are a large actors but it is still a fragmented market with many smaller local actors. They initiate projects to build new wood-processing plants or to renew old ones. When a new plant is being planned they set the capacity and other rough requirements. They contact a consulting engineer to carry out more detailed planning. As the owner of the plants they may also reach maintenance agreements with third-party companies (OEMs).

***Consulting engineer:*** The consulting engineer acts as advisor to the project owner. They help the project owner calculate the use of raw materials, water and energy needed for a new plant. They also set the dimensions for the facilities and functions as a project manager, hiring fabricators and subcontractors. In some cases they are involved in the material selection but usually this is left to the OEM/subcontractor to manage, as long as specifications are met. At this level there are large international companies such as Pöyry but also smaller local firms.

***OEM (original equipment manufacturer):*** Supplies the equipment (paper machines, peripheral equipment) the paper mill needs to function. The OEMs typically offers a number of off-the-shelf paper machines which can be ordered in various sizes but sometimes they are custom made to fit the given project. In these cases the custom fitting is based on the consulting engineer's specifications. The OEMs may or may not be involved in the assembly of the mill. If they are not, a third-party assembler is contracted by the consulting engineer. The OEMs buy most individual parts of the paper machines from subcontractors. An OEM prepares blueprints and sends them to the subcontractor who manufactures the component accordingly. The OEMs sometimes manufacture some small parts in-house. It is also common that the OEMs supplies services as well as equipment. These include: maintenance, recycling, and tuning of the equipment. Some major companies at this level are Valmet and Andritz. The market is dominated by large players such as these.

***Subcontractor:*** This actor supplies the OEM with individual made components to the paper machines. Small metal workshops fall into this category. This is a very fragmented market with both local and more nationwide actors. In Northern Europe the OEMs usually contracts subcontractors from Eastern Europe due to their lower fees.

***Distributor:*** The distributor buys material from producers and resells it directly to the end-user or customer.

***Producer:*** The producer is the actor who manufactures the stainless steel plates (e.g. Stainless Inc.).

#### *4.3.4.2 Value adding activities in pulp and paper*

As in the water treatment segment the distributor adds value by repacking and distributing plates to the subcontractors and OEMs. Although in this specific segment it is more common that the steel is delivered directly from the producer. This is mostly due to the larger quantities used in this segment compared to the water treatment segment.

The different components that the OEMs buy and (sometimes) assemble are made by a variety of subcontractors. Small metal workshops make pressure vessels and liquor tanks by welding, bending, and cutting. The subcontractor normally likes to cut the plates in-house but they sometimes buy the plate pre-cut from the producer (Stainless Inc.). Stainless Inc. have a subsidiary that produces the suction roll shells used in the paper mills. This is done by lathing. Stainless Inc. also have a subdivision that do plasma cutting, welding and chamfering (chamfering is a process that prepares the plates for welding by creating a gap between the two plates for the weld to attach to). Thus, the producer is involved in the value adding activity and do not only supply the plate.

The OEMs sometimes manufactures parts (such as head boxes) in their own workshops. When this happens it is not uncommon that they buy the material directly from the producer.

### 4.3.5 Distributors

The distributors in the Swedish stainless steel industry are major actors as large parts of the total stainless steel sales passes through them. The distributor adds value to the products by activities such as: repacking, stockholding and logistics solutions. There are three types of distributors: Generalists, who sells both carbon and stainless steel of various kinds, actors that only distribute stainless steel, and finally some niche actors who specialize in certain product segments. The distributors do not only sell thick plate (except for some niche players) but has a wide product range of coil, plate, and tube. The distributor market is highly competitive and the margins are low. This is partly due to that the end customer puts pressure on their suppliers and subcontractors who in turn presses the distributors and pushing market prices down. A number of large generalists and stainless specialists have a large part of the market but there are also numerous smaller actors which make the total market fairly fragmented.

The distributor buys stainless steel in large quantities from the producer and therefore gets discounts which allow them to make money on the difference between the purchase price and the sale price (which is low in this industry). Their buying criteria when choosing producer to purchase from are terms of payment, delivery time, price, flexibility, and product range. The distributors do not only purchase stainless steel from Sweden or Europe, roughly 20 percent of the distributed stainless steel is from China (Source: interview). The steel bought from China are mostly standard grades. Many customers do not trust that the quality from China is good enough and wants to buy European steel; otherwise the part imported from China would probably be higher.

The distributor does not change between different market segments but some segments have larger parts of distributor driven sales. Some large segments are packaging and medical. The largest distributor segment for thick plate sales is the pulp and paper industry.

# 5. Analysis

In this section the empirical results will be analyzed by means of the conceptual framework and literature in order to answer the thesis' research questions. First of all, to answer the first research question, the market demand of the stainless steel industry will be analyzed. Thereafter, the second research question will be answered through an analysis of servitization related to the stainless steel industry.

## 5.1 Market demand

This section will analyze the market demand of value adding activities in the stainless steel industry. Firstly, the main characteristics of the demand will be described and subsequently each segment will be analyzed with help of the conceptual framework described in section *2.3*.

### 5.1.1 Main characteristics

In general, the demand within the stainless steel industry is project-based in the sense that it is driven by large projects with a complex set of actors involved. Simplified, the supply chain of actors within the industry can be described as in Figure 10.

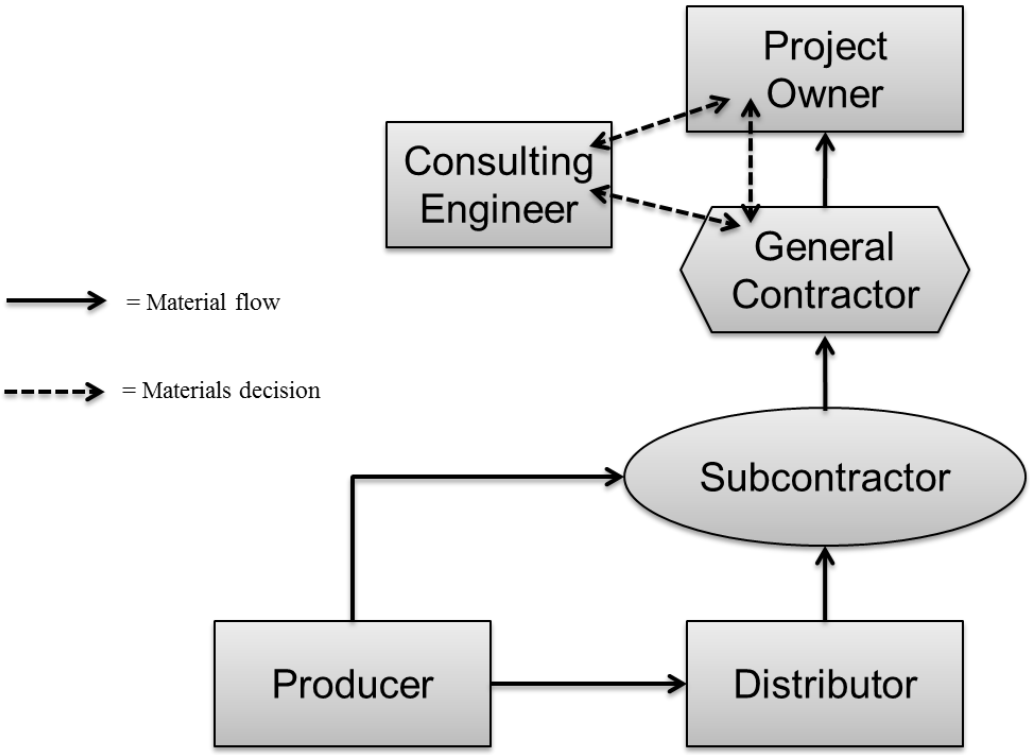


**Figure 10. Typical supply chain in the stainless steel industry.**

Globally, the demand for stainless steel is growing and has been so during the latter decades at a rate that outrivals similar materials such as carbon steel. This is in part because of the fact

that stainless steel is increasingly becoming demanded in applications where carbon steel earlier has dominated by virtue of, for example, its environment-friendliness and actors' increased awareness of the advantages with the material.

With regards to the value adding activities, three types can be identified as demanded by actors within the industry: *material packages* including stockholding, logistic solutions and package assembly; *product-related services* including additional operations such as cutting, welding, assembly and installation at site; *project-related services* including services such as design, calculations, and project management. Generally, material packages are sold to subcontractors or general contractors/OEMs; product-related services are demanded by general contractors/OEMs and project-related services are requested by the project owners. In segments where stainless steel is established these activities are performed by distributors, subcontractors and general contractors/consulting engineers respectively.

### 5.1.2 Infrastructure

Infrastructure is a fairly constant segment with a set market structure and some larger actors that dominate the downstream tiers of the supply chain. The composition of these actors and also their preferences can be viewed as stable over time, thus the *market turbulence* is low.
When it comes to stainless steel in infrastructure, more advanced grades, such as duplex, are normally used. This means that competition will be a bit lower than in for example water treatment. However, the competition is still high and margins on plates are low. In other tiers of the value chain competition is lower. For example, the empirical results show that subcontractors do not experience the pressured margins that producers do. Also, when it comes to construction work with stainless steel, engineering capabilities on the Swedish market is limited at the moment, which means that there are possibilities for producers to add value by offering such activities if they have the needed resources. All in all, the *competitive intensity* for producers in this segment can be considered high relative to other levels downstream in the supply chain.

Current *segment size* for infrastructure is limited since most construction projects are made of carbon steel or concrete. The potential segment size is considered to be around 5,000 tonnes stainless steel annually based on the amount of carbon steel that is used today. Considering the total demand of thick plate in Sweden annually is around 14,000 tonnes this can be deemed quite high, though it is hard to determine when or if it actually can reach these levels.
When it comes to *segment growth*, it should be said that the segment has been growing slowly during the last years where projects have been starting to be constructed in stainless steel,

though not in a large scale yet. Should there be a breakthrough with Trafikverket and their specifications, the growth could become very fast however. Therefore, actual growth can be considered low while potential growth is very high, resulting in a medium segment growth overall.

Within the infrastructure segment, the *downstream profit margins* are hard to determine, considering the amount of business done in this segment is limited at the moment. However, for some types of downstream activities the changes in margins can be estimated to be similar to those for carbon steel. From the empirical research it can be concluded that the profit margins for distributors are low for all market segments and actually similar to the margins for the producers in most cases. Further downstream, in the subcontractor tier, where operations such as installation, assembly and manufacturing of components such as beams are performed the margins see a significant increase. The profit margins differ between companies but generally in this tier of the supply chain actors are profitable, which is something that cannot be said about all producers and distributors upstream in the chain. Value adding activities can also be performed further down the supply chain, at general contractor or consulting engineer level, where project management, design, and calculations are carried out. Especially for the design and calculations operations, the empirical results show that the capabilities on the market at the moment are limited. Therefore, it can be assumed that margins on this type of services can be high due to low competition.

The *influence of major customers* differs depending on if the customer is a distributor or some other actor. For the business in this segment that goes through the distribution channel, a few larger actors have a high market share. Moving downstream, the subcontractor tier is less concentrated, although they still seemingly manage to squeeze prices, considering none of the actors upstream can keep sufficiently large margins on their products to be profitable. With regards to shares of sales from the producers, this is usually spread over a large number of actors, though the bigger distributors represent a majority of the business.

The *power of distribution channels* does not necessarily differ much between the segments, the market share of the larger distributors is high and the degree of channel innovation is low within all market segments. However, the degree to which the distribution channel is used may vary. In infrastructure, the larger projects are normally supplied directly from producers without using the distributors as an intermediary. There are also many projects that use smaller volumes of steel and in these cases the distributors will take its part in the chain. The

important point would be that in order for the producers to gain margins and be profitable in this segment, the use of the distribution channel should be limited.

**Table 7. Summary of evaluation of infrastructure feasibility for servitization.**

| Factor | Low | Medium | High |
|---|---|---|---|
| **Market Turbulence** | X | | |
| **Competitive Intensity** | | | X |
| **Segment Size (potential)** | | X | |
| **Segment Growth** | | X | |
| **Downstream Profit Margins** | | | X |
| **Influence of Major Customers** | | X | |
| **Power of Distribution Channels** | | X | |

To summarize (see Table 7), the downstream profit margins in this segment are high, which coupled with the fact that the competitive intensity is high make value adding activities interesting to investigate within the segment, even though market turbulence is deemed to be low. However, a key factor within this segment is to actually establish stainless steel as a standard material. If this can be achieved, the segment size would be high and therefore present an interesting opportunity for additional sales for Stainless Inc. The infrastructure segment offer possibilities to provide both product- and project-related services. An example of this could be Stainless Inc. working in collaboration with a general contractor to design, calculate, and deliver stainless structural parts for a road-bridge. With such an added value solution, Stainless Inc. may charge more than they would have been able to do by just selling the steel.

### 5.1.3 Water gates

For the hydropower part of the segment, which is the major part, there are a couple of larger project owners that dominate the Swedish market. Also other parts of the chain, such as general contractors, are fairly stable. However, customer preferences have changed over the last years where stainless steel has become more of a standard material for the application. Also, the subcontractor tier cannot be considered stable, but rather there have been an influx of subcontractors during later years. All in all, *market turbulence* can be deemed medium since downstream parts of the chain are stable, while upstream parts are changing.

As usual, the competition in the producer tier is high, even though the material used for the applications are of the more advanced grades. However, the competition on the Swedish market for the previously mentioned offer that Stainless Inc. delivers in collaboration with subcontractors is very low, as can be seen by its high margins. Further down the chain, when it comes to for example installation at the subcontractor tier the competition is also much lesser than at producer level. This is evidenced by the fact that several subcontractors have been able to get into the market during later years. All things considered, the *competitive intensity* can be considered high at producer level relative to competition downstream the chain.

The Swedish *segment size* of 750 to 1,000 tonnes thick plate annually can be considered as medium relative to the total Swedish thick plate demand of 14,000 tonnes. Also, it should be taken into consideration that the segment size in Sweden could increase if the application expands into larger gates as well. The potential segment size for Europe was estimated to 8,000 tonnes, which also could be considered as medium in relation to the total European market of 156,000 tonnes (SMR, 2014). However, this part is not yet a realized segment size. Without quantitative data concerning the *segment growth* for this application, evaluations can be made based on the fact that large investments are to be made in Swedish hydropower over coming years and that a push has been made to expand stainless steel into larger types of water gates as well. Based on this, it can be concluded that the segment will experience at least medium growth over the coming years, and probably even large growth if stainless becomes standard for larger gates.

In this segment, Stainless Inc. already has done some business that shows the potential value of further exploring a downstream move. They have worked together with subcontractors to offer water gates directly to project owners or general contractors. In those projects, Stainless Inc.'s role has been to deliver material kits to the subcontractors that are ready for installation at site. For this offering, Stainless Inc. has been able to reach *profit margins* more than four times higher than their average. Therefore, the attractiveness of pursuing this type of downstream business to a wider degree can be considered high.

For the profitable current offering, Stainless Inc. has a few subcontractors that they work closely with as customers. However, these have not been able to squeeze prices since Stainless Inc. so far has been the only actor who can offer this type of service to the subcontractors. However, there is also a part of this segment that goes through the distributor

channel, where prices, like in other segments, are under pressure. The subcontractor tier is quite fragmented with around 20 small sized firms and there is no subcontractor who dominated, in term of market size. If Stainless Inc. could get their offering to a larger number of subcontractors instead of in some cases having to take the distributor way, they can manage to keep high margins on a larger part of their sales, since customers will have a hard time influencing the price downwards. All in all, *influence of major customers* can be considered medium, since the influence of subcontractors is quite low, while influence from distributors is fairly high.

With regards to the *power of the distribution channel*, the water gate application is a segment where the distributors are quite involved in the chain. Since individual projects usually concern a fairly low volume of steel, most subcontractors buy their material from distributors rather than producers. There are a couple of dominant distributors and prices are therefore squeezed for the part of the sales that takes this route. Since the distributor channel is dominant within the segment, the power of it is considered high.

**Table 8. Summary of evaluation of water gates feasibility for servitization.**

| Factor | Low | Medium | High |
|---|---|---|---|
| **Market Turbulence** | | X | |
| **Competitive Intensity** | | | X |
| **Segment Size** | | X | |
| **Segment Growth** | | X | |
| **Downstream Profit Margins** | | | X |
| **Influence of Major Customers** | | X | |
| **Power of Distribution Channels** | | | X |

To summarize (see Table 8), this is a segment where Stainless Inc. themselves have shown the value of moving downstream. The margins and the competitive intensity downstream the supply chain both point in the way of value adding activities as an attractive alternative for this segment. Also, the power of distribution channels makes it attractive to expand the current offering and the acceptable segment size and growth make the segment fairly lucrative. In this segment mainly product-related services can be considered, and the current offering is an example of such a service.

### 5.1.4 Water treatment

The first evaluation factor, *market turbulence*, is deemed low in the water treatment and biogas segment. Looking downstream from the perspective of the contracting companies and general contractors the composition of customers has been the same over a long period of time and their preferences have not changed much from year to year. The customers are, according to the contracting companies, mostly governmental and to some extent private industrial customers who have the same preferences, and therefore, even if changes in composition would occur the demand would remain similar. Even if preferences would change it would not impact the stainless steel part of the industry much since it is still a corrosive environment where stainless steel is needed. This also applies, in some extent, to the subcontractors. There are lots of small subcontractors which may make the turbulence higher than downstream but their customer's preferences are not likely to change either. With this in mind, the overall market turbulence is considered low in this segment.

Looking at the *competitive intensity* on various levels in this industry and comparing it to Stainless Inc.´s position a few conclusions can be drawn. First, at the distribution level the competition is as high as in the stainless steel industry. Second, further downstream at the subcontractor level the market is fragmented with many small actors and a few bigger players. The competition at this level is considered lower than at the producer level. This can be explained mainly by lower entry barriers and lower fixed costs. Third, continuing downstream, the market for large plants is dominated by three to four large contracting companies and roughly twenty smaller companies dominate the market for smaller facilities. The entry barriers are high due to intangible resources such as knowledge and relationships but low exit costs and adequate market growth even out the competition. This makes the competitive intensity moderate, but lower than at the producer level. Overall the competitive intensity in the water treatment segment is lower, at most levels, than at the stainless steel producer level, which justifies the medium score in the *competitive intensity* factor.

The Swedish water treatment (and biogas) *segment size* is between 2,500 and 3,750 tonnes stainless thick plate per annum which could be compared to the end demand on the Swedish market of 14,000 tonnes 2013. Therefore, the water treatment industry represents roughly 18 to 27 percent of the Swedish market. The segment size is deemed high. Qualitative data from interviews points out this segment as upcoming and growing much due to renovations of governmental plants, this lead to a medium score in segment growth.

Looking at *profit margins downstream* a few points can be made. At the contracting companies level the profit margins (expressed as income/net sales) have been pending between 4.5 and 6 percent recent years. In the next level upstream are the subcontractors which manufacture pressure vessels and water tanks used in the plant. Subcontractors say that they have a "good enough" margin on their products, which is difficult to put a figure on. The margins on the distributor level are low (many distributors are taking losses) and would not offer incentives to move to that level. Comparing these to Stainless Inc.´s negative margins and a competitor's 1 to 2 percent margin the downstream profit margin factor is deemed medium.

The largest distributors in Sweden have a reasonably big share of the market and in this segment the producers' customers are usually the distributors (and occasionally the contracting company). These facts indicate that much of the profits in this segment come from these customers, the distributors. On the other hand, the margins for steel sold to distributors are generally low (compared to other customers), which talks against the profit argument. Overall, these details speak for an average *influence from the major customers* in this segment. Therefore the score in this category is assessed to be medium.

As mentioned the distributors themselves is the main customers in this segment. On the contrary the distributor market is competitive with a fair amount of actors; despite this the *power of the distribution channel* in this segment is, as in the water gate segment, high.

**Table 9. Summary of evaluation of water treatment feasibility for servitization.**

| Factor | Low | Medium | High |
|---|---|---|---|
| **Market Turbulence** | X | | |
| **Competitive Intensity** | | X | |
| **Segment Size** | | | X |
| **Segment Growth** | | X | |
| **Downstream Profit Margins** | | X | |
| **Influence of Major Customers** | | X | |
| **Power of Distribution Channels** | | | X |

To summarize (see Table 9), segment size and power of distribution channel are high while the market turbulence is low. All other factors are assessed as medium. The segment size is 18 to 27 percent of the Swedish stainless thick plate market and the segment growth is

adequate. The competitive intensity is lower in some levels and higher in other. The evidence is not overwhelming that a downstream move should be pulled off in this particularity segment but it is definitively worth considering. For example, product-related services, such as offering more complete products can be considered in this segment. The reason behind this is that water tanks and pressure vessels used today are produced by subcontractors and at that level of the value chain the margins are often higher than at the producer level. Thereby, the producer can consider offering more complete products or cooperate with subcontractors to provide such a solution.

### 5.1.5 Pulp and paper

The analysis starts by looking at *market turbulence* in the pulp and paper industry in the different parts of the supply chain. The end customers (project owners), the paper companies who produce the paper, are geographically dispersed, and as a consequence, the market structure is fragmented. The composition with a few large actors and several small are not likely to change overnight. If their preferences change it would not easily impact the use of stainless steel since the aggressive environment makes it necessary. Consequently, the market turbulence is low in this level. Moving upstream, a few large companies dominate the OEM market and therefore no rapid changes in customer composition is likely. The OEMs have longstanding relationships with suppliers and subcontractors thus changes in preferences are not likely to come as surprises to those, and in case those change, they would probably not happen quickly. Therefore, low market turbulence at this level as well. The subcontractor level is fragmented with numerous small actors. The turbulence on this level is higher than the other levels due to that the firms are not as long lived and therefore actors change more often. Preference is on the other hand similar and has been for a long time. Overall, the market turbulence is relatively low in this segment.

The *competitive intensity* in the pulp and paper industry compared to Stainless Inc.´s is deemed to be lower generally. The consulting engineer level has a few large actors and many small which make it fragmented. The entry barriers are relatively high even if capital costs and fixed costs are low, this due to dominating intangible resources such as (tacit) knowledge and competencies but also as assignments often are given on relationship bases. Overall the competitive intensity is deemed moderate and less than on the producer level. The OEM level in the supply chain has a high market concentration, and a decent growth rate which lowers the competition intensity. On the other hand, high exit barriers (capital intense with specialized machinery) and high fixed cost (which forces utilization of production capacity)

raises the competition. Overall the competitive intensity is medium, which is lower than at the producer level (high). On the subcontractors level the market concentration is low and the actors are of similar sizes with comparable offerings, which increases competition. Oppositely, low exit barriers as well as low fixed costs reduce competition. Competitive intensity is therefore medium to high and lower or even with Stainless Inc.´s. In total, a lower to level competitive intensity give a medium score in the framework.

The size of the *global* pulp and paper segment is 16,800 to 25,500 tonnes of stainless thick plate annually. This can be contrasted to the world demand of 1,097,000 tonnes thick plate annually, which makes it a rather small segment with roughly 1.5 to 2.5 percent of the market. On the other hand, approximately 7 to 12 percent of Stainless Inc.´s sales were directly or indirectly to the pulp and paper industry. Thus even if small in a global sense the *segment size* is medium from Stainless Inc.´s perspective, this is important because it increases Stainless Inc.´s potential to servitize the segment. The compound annual growth rate (CAGR) of the global paper industry between 2013 and 2016 was predicted to be 6.1 percent (Marketline, 2012). Comparing this to the predicted CAGR of thick plate in the same period which was 5.8 percent the *segment growth* can be considered medium.

As discussed above the *competitive intensity* is generally lower downstream which should theoretically contribute to higher profit margins on average. Beginning on the engineering level the operating profits as a percentage of net sales varies from negative to 6 percent over various companies. Further, on the OEM level the EBITA margin for two large companies have pending between 4.3 and 4.9 in recent years. Finally on the subcontractor level the margins are *good enough* according to interviewees which, of course, are difficult to quantify. Stainless Inc. have struggled with negative margins a while but a comparable competitors have had margins in the region of 1 to 2 percent recently. Thus, the margins seem higher in most cases (or at least not lower) which led to a medium score.

The pulp and paper industry is dominated by a small number of OEMs who are the end users of the stainless steel. Stainless Inc. delivers small amounts of steel directly to those customers but most of the steel passes through distributors and on to subcontractors before reaching them. Therefore, the major customers are, like in the other segments, the distributors. But as the major customers not are as influential as in the water treatment segment the score in the *influence of major customers* factor is deemed medium.

As stated above the distributors are major customers which imply that the *power of the distribution channels* is medium at least. The degree of channel concentration is medium with some large actors dominating the distribution, but also many smaller players. Therefore, the distributors are not able to squeeze prices to really low levels and the score is therefore medium in this category.

**Table 10. Summary of evaluation of pulp and paper feasibility for servitization.**

| Factor | Low | Medium | High |
|---|---|---|---|
| **Market Turbulence** | X | | |
| **Competitive Intensity** | | X | |
| **Segment Size** | | X | |
| **Segment Growth** | | X | |
| **Downstream Profit Margins** | | X | |
| **Influence of Major Customers** | | X | |
| **Power of Distribution Channels** | | X | |

To summarize (Table 10), the pulp and paper industry has low market turbulence due to a mature industry with consolidated positions. The competition is generally lower downstream than on the producer level and the segment size as well as segment growth are decent. The last three factors are also deemed medium which make this segment the least attractive of the four segments for value adding activities. However, some possibilities still exist. For example, similar to the water treatment segment, water tanks and pressure vessels are used frequently in this segment, which is something Stainless Inc. can take advantage of. By providing these product-related services, both segments can be served simultaneously, thus increasing the possible market for the products.

## 5.2 Servitization

One important factor, when considering servitization, is the suitability of the offered product (Tukker & Tischner, 2006; Windahl, 2007; Tan, McAloone & Matzen, 2009). Or to state it differently, a product suitable to apply a PSS strategy on is favorable when considering servitization at the left side of the continuum (see Figure 1), where the product act as base and the service “add-on”. The product in this case is stainless steel plates which are either used as input material in other manufacturing processes or as construction material. To add to that, the material itself is maintenance free, apart from cleaning every now and then to keep its appearance. Therefore the product cannot be seen as an installed base product as it does not

require any attention after it is bought. Thus, Stainless Inc.´s products do not seem very suited for PSS strategies and in this circumstance, not suited for servitization. However, as found out in chapter 5.1.1, there is demand for value adding activities. For example, *material packages* as stockholding and logistics solutions as well as *product-related services* such as assembly on site and welding operations could still be appropriate for servitization on the left side of the continuum. On the other hand, activities in the *material packages* category are exposed to high competition (see section *4.3.5* about distributors) with low margins as result, which speaks against one of the main drivers of servitization, financial benefits. To summarize this reasoning using Olivia and Kallenberg´s continuum (Figure 1), a position in the left corner where the product is used as a *Trojan horse* to introduce services is possible with the current product, although, these services are one-off cases (installation, cutting) and not focused on maintenance or PSS strategies.

Looking at the other end of the continuum, where the foundation of the offering is service and the product an "add-on", some interesting points can be made. As discovered in section 5.1.1, there is market demand for *project-related services*, such as design and project management, mainly in the infrastructure segment due to limited knowledge about stainless steel as building material in that segment. In other investigated segments, such as the pulp and paper as well as the water treatment segment, the demand for these services is also present but unlike the infrastructure segment, there are many knowledgeable actors and a market structure in place which may make it harder to compete. These types of *project-related services* are found to offer higher margins (section 5.1.2) and give possibilities to specify materials and thereby "lock-in" certain materials favorable for the company, leading to less competition on price and also offer potential to promote the company. Thus, the demand for these types of services is in line with the three major drivers behind servitization: financial, strategic and marketing related.

In conclusion, servitization in a more "traditional" meaning which focuses on installed-base products as a *decoy* to sell services does not seem feasible in the stainless steel industry due to the limitations of the product itself. *Material packages* and *product-related services* are two categories which could occupy the left side of the continuum but *material packages* seem unlikely to be financial viable. *Product-related services* do seem feasible but are more one-off activities without much continuity in revenues. Also, *project-related services* may be a possibility in certain market segments. Thus, the answer to the research question is not as clear cut as a simple "yes or no". It depends. The authors have found demand for value adding

activities which could be met by servitization of the business, both by offering products with services attached and by services to sell (or lock-in) products.

# 6. Discussion

While this thesis focus on analyzing a downstream move from a financial perspective based on market opportunities, striving towards more differentiated product offerings also comes with other implications. For example, a turn towards servitization would mean a change of business model for Stainless Inc., from simply producing rather standardized stainless steel plates in large volumes to an improved offering, which creates more value for the customers and differentiates the company. This is aligned with recent literature, which emphasizes the need for companies to be able to make use of so called business model innovation in order to increase their competitiveness on increasingly competitive, global markets. According to Johnson *et al.* (2008), business model innovation is seen by many as potentially more important than product or service innovation in the near future. Where servitization could be one way to increase the company's competitiveness, there may also be other business model innovations, depending on the customers' demand characteristics, that can change the increasingly troublesome market position for the organization.

The concept of business model innovation is also associated with certain barriers for firms when it comes to implementation of a new business model. Especially difficult could implementation be when an existing business model is supposed to be complemented by another, new, business model, which is the case in this thesis where a differentiation towards servitization possibly could complement Stainless Inc.'s current business model of selling stainless steel plates. Conflicts steaming from competing with dual business models and keys to handle this problem are explored in recent literature (Markides & Charitou, 2004; Chesbrough, 2010; Gebauer et al., 2006).

How the two differing business model would work together is certainly something that Stainless Inc. needs to look further into if they were to pursue the idea of taking value adding activities a step further. In some cases, complete separation of the business models may be preferred, i.e. using different organizations fully committed to the separate business models would be an alternative. Considering that the production of stainless steel plates most likely continue to be the company's main business, the value adding activities part risk being overlooked in some cases if put within the same organization. Separate business units would ensure that resources are dedicated to implementation of a new business model and could

increase the chance of success. However, exploitable synergies between the business models should also be considered, and to be able to exploit those, collaboration between the potentially separated business units would still be advised.

All in all, this thesis only investigates the market demand for a downstream move into value adding activities. As such, no conclusions can be drawn in order to answer the question if such a move would be a wise decision by Stainless Inc. In order to do so, a more thorough business plan would need to be developed and analyzed to quantify the potential benefits and also the added investments that would be required. In addition, as mentioned in the servitization section (*2.2.4*), another important factor to take into account when considering entry into a new market is that the new entrant needs to prove themselves better than the incumbents, which further complicates servitization. Likewise, a deeper analysis to fully understand which way to go about an implementation would be fundamental.

## 6.1 Future research

This thesis takes a market view related to the subject of servitization within a specific industry, the stainless steel industry. As such, it adds to research within a fairly unexploited field, namely servitization in a process manufacturing industry. However, due to geographical and segmental delimitations, the results of this thesis are hard to generalize not only to the whole process manufacturing industry, but to the stainless steel industry as well. Research covering remaining stainless steel segments and regions would be required in order to draw conclusions for the whole industry.

Furthermore, interesting research could discuss a possible implementation of servitization within a process manufacturing industry. To the authors' knowledge, there are no documented cases of when servitization has been used implemented in this type of industry and thus information about key success factors and problems specific to the industry is limited. In general, an expansion of the existing research on the transformation from being a solely manufacturing company to being more servitized would be valuable.

# 7. Conclusions

The purpose of this thesis was to investigate the potential for value adding activities in the stainless steel industry and to explore if the market demand is in line with a turn towards servitization. Market demand in the stainless steel industry is characterized by being project-based and is experiencing significant growth globally. However, competition is tough for the steel producers and profit margins typically increase downstream in the value chain where value adding activities such as different product- and project-related services are in demand. The market opportunities for producers in pursuing such activities vary between market segments, depending on a number of factors.

Infrastructure is an interesting segment considering the higher downstream margins, as well as the competitive intensity when it comes to value adding activities and especially project-related services. A major reason why this segment is appealing lies in the factor that stainless steel is not yet established in the segment, and as such the opportunities here could be viewed as having more of a long-term character. Similar to the infrastructure segment, the water gates segment is attractive due to its substantially higher margins downstream. For this segment, the focal company of this thesis, Stainless Inc., already has an established value adding offering which should be beneficial for them to expand on.

Water treatment and pulp and paper are interesting due to the size of these segments, where especially water treatment is a large part of the Swedish market for stainless steel. However, other factors give no overwhelming evidence that these segments would be of particular interest when it comes to value adding activities for a stainless steel producer. All in all, the segment analysis shows that water gates (short-term) and infrastructure (long-term) are the most attractive segments for an added value type offering.

Based on the above, it can be argued that the stainless steel market demand is in line with a turn towards servitization, at least in a couple of selected market segments. Even though the more traditional type of servitization is not feasible for stainless steel, evidently other types of services could be possible to incorporate in an offering. However, this thesis only gives a market-based perspective and other factors, such as internal resources and the effects of a new business model, must of course be taken into account before pursuing the process of servitizing the company or business unit.

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# Appendix

### Example of interview template

1. What is your role in a project?
2. How does the supply chain in the sector look from your point of view?
3. How does the decision-making process look in your sector?
    a. What actors make what decisions?
    b. Are there any limitations to this process?
    c. What type of decisions is made by your company?
4. Is there anything that could facilitate the decision-making process?
5. What parts of the project requires the largest amount of time/energy?
6. Do you have any requirements, which you feel cannot currently be fulfilled by other actors on the market?
7. Do you currently see any other problems on the market?
8. What is the market size and market growth in your segment?
9. Are there any significant trends you can see on the market?
10. How profitable is business in your tier of the chain?
    a. How does it compare to other tiers?
11. Can you describe the competition in your tier?
12. What are the most important criteria for you when choosing suppliers?