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# An Evaluation of Critical Capabilities and Improvement Areas for Competitive Manufacturing in a Developed-Country Environment

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**Abstract:** This research evaluates the critical capabilities and improvement areas for competitive manufacturing in a developed-country environment. A multiple-case-study approach is applied, consisting of three manufacturing firms located in Sweden. The case study combines both quantitative and qualitative evaluations of the critical capabilities found in the extant literature. The research reveals fifteen critical capabilities and sixteen improvement areas for competitive manufacturing in a developed-country environment. The results show that the firms develop capabilities in a cumulative manner, starting with cost and quality, continuing with time and flexibility, and finally trying to improve innovation and sustainability. To develop competitive manufacturing operations in developed counties, it is therefore vital to improve capabilities related to time, flexibility, innovation, or sustainability. Irrespective of the targeted capabilities, they must contribute to cost-efficient operations and high quality must always be maintained. The efforts to develop capabilities related to innovation and sustainability may be expensive in the short term, however they can provide better cumulative results and competitiveness in the long term.

**Keywords:** manufacturing strategy; capabilities; developed countries; Sweden



**Citation:** Ascic, I.; Ascic, J.; Hilletofth, P.; Pimenta, M.L.; Hilmola, O.-P. An Evaluation of Critical Capabilities and Improvement Areas for Competitive Manufacturing in a Developed-Country Environment. *Sustainability* **2022**, *14*, 6678. https://doi.org/10.3390/su14116678

Academic Editors: Yoshiki Shimomura and Shigeru Hosono

Received: 28 April 2022
Accepted: 28 May 2022
Published: 30 May 2022



## 1. Introduction

The core of a manufacturing firm is to serve its customers by creating value for them and, through these actions, build a long-lasting competitive advantage [1,2]. To achieve this, the manufacturing firm must identify, develop, and continuously enhance the most critical manufacturing capabilities (that is, work with manufacturing strategy implementation) [3,4]. The manufacturing firm should aim to develop the manufacturing capabilities with the highest impact on organizational performance, and the capabilities should also be aligned with customer requirements in order to achieve a sustainable competitive advantage [5–7]. The organizational performance is directly linked to the developed manufacturing capabilities [8]. During times of significant changes, such as economic crises, it has been found that certain strategies give hedge and provide robust performance as compared to more traditional strategies, such as using a traditional subcontracting strategy [9].

Which manufacturing capabilities that a firm pursues is typically influenced by the external environment [8], and it can be distinguished in different ways. One way is to distinguish between developed- and emerging-country environments [10,11]. Manufacturing operations located in emerging countries tend to focus on cost efficiency and competition

on the basis of price, while manufacturing operations located in developed countries typically focus on enhancing the value offering (e.g., innovativeness) and the competition on the basis of the highest value for money [12]. This implies finding opportunities to avoid price competition by differentiating the value offering by developing manufacturing capabilities related to quality, time, flexibility, innovation, or sustainability [13,14]. It should be emphasized that, in comparison to the service sector, the differences between emerging- and developed-country operations could be much smaller [15]. Sustainability has, in recent years, increased in importance and risen on the agenda for developed-country manufacturers, while emerging-country manufacturers simply try to fulfill the minimum criteria [16].

Since the start of globalization, manufacturing operations have been extensively relocated from developed to emerging countries [10,17]. This has been sustained by the idea that there is an advantage in having manufacturing in emerging countries. The key motive has been to reduce the unit cost by exploiting lower labor costs [14,18,19]. This process has generated issues and has further intensified the competition for manufacturing firms located in developed countries [20]. In this process, developed countries have lost jobs, manufacturing importance, and their economies have declined [21,22]. However, relocation failures and market developments have recently led to an intensified debate on the opposing movement [23–25]. This debate has also been further intensified after the coronavirus pandemic [26,27].

Many firms are changing their emerging-country dependency, going from one centralized manufacturing location (e.g., China) to a few, while also locating manufacturing closer to main markets, usually in developed countries [27]. Bringing back manufacturing to developed countries was earlier only considered to avoid price competition. However, firms have recognized the importance of inventory availability [28], global logistics costs [29], and resilient supply-chain operations [26,29]. These changes do not only concern single manufacturing units, but typically most of the important suppliers also co-locate. The supplier involved not only has the advantages of supply and inventory holdings, but, in addition, innovation capabilities are also said to improve through clustering [30]. This underlines the possibility of having competitive manufacturing in a developed-country environment [31].

The extant literature on the critical capabilities for competitive manufacturing is extensive [32,33]. However, while there are some notable exceptions [8,10,34], little emphasis has been put on the critical capabilities for competitive manufacturing in a developed-country environment [8]. One possible explanation may be the relentless focus on manufacturing offshoring and outsourcing in the academic and business literature. In addition, there are a limited number of studies that present up-to-date research that more accurately reflects the current market situation [33]. Hence, the literature provides limited theoretical and practical support with regard to how firms located in developed-country environments should compete [8,34]. This includes a better understanding of the necessary capabilities to develop competitiveness, and how to look for sustainability and local development [8,35,36].

The current state of the literature reveals a research gap in the contemporary research that provides alternative approaches, and distinctly of those sustained by the idea that there is an advantage in having manufacturing located in an emerging-country environment [35]. The recent trend of relocating manufacturing back to developed countries [14,25,36–39] highlights a need for updating our knowledge. Hence, the aim of this research is to evaluate the critical capabilities and improvement areas for competitive manufacturing in a developed-country environment. The specific research questions are: (1) 'Which capabilities and improvement areas are critical for competitive manufacturing in developed countries?'; and (2) 'How could manufacturing capabilities be established in developed countries considering a cumulative perspective?' This research uses a case-study approach that includes three manufacturing firms located in Sweden. The case study included a quantitative and qualitative evaluation of the critical manufacturing capabilities found in the extant literature.

This research is structured as follows: In Section 2, a literature review is provided concerning manufacturing competitiveness models. We also review the critical capabilities (and priorities) of manufacturing within a developed-country environment. The research methodology follows in Section 3. An examination and analysis of three cases is completed in Section 4. We discuss the research findings in Section 5. In the final Section 6, the research is concluded, and further research areas are proposed.

## 2. Critical Capabilities for Competitive Manufacturing in Developed Countries

### *2.1. Competitiveness Models*

Manufacturing strategy implementation consists of two core elements: competitive priorities and manufacturing decisions [32,40]. The competitive priorities are the pursued capabilities that the manufacturing firm emphasize to fulfil the overall business strategy, while the manufacturing decisions are the series of decisions that a manufacturing firm makes that determine the actual manufacturing capabilities [8,41,42]. The firm makes decisions on the basis of the priorities in combination with the available resources, which generate the firm's manufacturing capabilities [8]. Thus, manufacturing capabilities play a key role in terms of strategically aligning skills and resources to fulfil customer needs [2]. They are also key for business-model changes and innovation [1].

There are several competitiveness models that describe this predicament. The two most frequent models are the trade-off model and the cumulative model [43]. In the trade-off model, certain manufacturing capabilities are regarded as more important than others from a strategic perspective (trade-off introduced already early on by Skinner [44,45]). This perspective suggests that manufacturing capabilities are developed individually. Consequently, the management team needs to carefully assess which manufacturing capabilities should be prioritized [46]. However, as the competitive environment is increasingly intensifying, this results in the fact that firms must excel in multiple manufacturing capabilities. From this perspective, it is arguable that manufacturing capabilities are built on each other cumulatively and are developed simultaneously [47,48].

The cumulative model was originally developed to describe the best-performing firms; however, there exist empirical examinations and evidence that suggest it has reached general dissemination among companies in numerous countries [49]. However, the cumulative model seems to form in a different fashion within developed and emerging countries [16]. Often, cost is not an issue in emerging countries, and flexibility, as well as sustainability, are the last capabilities to be improved. Rather to the contrary, cost efficiency is chased in developed countries, and mostly with process redesign.

### *2.2. Critical Capabilities*

This research takes its departure from a recent framework of manufacturing capabilities that was developed through a systematic literature review [33] and later revised through empirical research in a developed-country environment [34]. The framework includes 22 capabilities [34], which are grouped into six main groups, with each group representing a distinct perspective on how to create competitiveness (Figure 1). The manufacturing environment (i.e., developed or emerging country) influence the criticality level of these capabilities [8,12]. These capabilities are presented below and are discussed from a developed-country perspective.

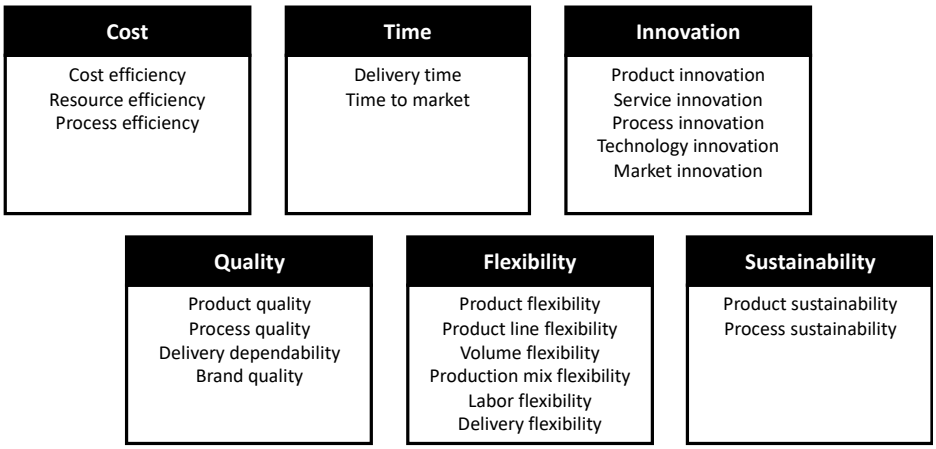


**Figure 1.** Critical capabilities for competitive manufacturing operations (based on [33,34]).

The first group of capabilities is granted for cost. These capabilities focus on achieving cost efficiency in various ways [50–52]. Cost reduction requires involvement from all functional areas within the firm; however, most of the costs are linked to manufacturing [53]. In the manufacturing area, cost efficiency is linked to achieving or maintaining low raw-material, labor, and manufacturing costs [54–56]. Companies that develop cost-related capabilities usually adopt lean strategies [49]. However, it is usually not feasible for firms located in developed countries to compete solely on the basis of cost [16]. To stay competitive, it is important for these firms to develop other capabilities (e.g., time and flexibility) that reach beyond the scope of lean strategies [55].

Quality is the basis for the second group of capabilities. These capabilities, among other things, focus on the provision of high-performance products [56,57] and reliable products [8,58]. The provision of high-quality products also helps firms to improve their brand value and image, which are important quality-related capabilities [59,60]. A final capability is the ability to deliver on time. Quality-related capabilities are often considered most critical (i.e., a market qualifier) when manufacturing is located in developed countries [14,54]. Hence, firms located in such contexts must first develop and constantly improve quality-related capabilities, and later put more emphasis on other types of capabilities [61].

The third group of capabilities concerns time. These capabilities focus on providing products to the customers in a rapid manner. This involves both fast product delivery [62] and short time to market [63]. Firms that compete on the basis of time may not have the most cost-efficient manufacturing, nor the best-performing products, but are able to compete on rapid deliveries and product development [55]. This means that successful firms located in developed countries respond to the current competition through differentiation strategies that emphasize time-related capabilities [56]. Shorter time to market has many benefits, including a higher market share, increasing profits, and quicker break-even times [64]. The ongoing technological development and reduced product life cycles that characterize developed markets push firms to constantly improve time-to-market and product-delivery times [65].

The fourth group of capabilities is related to flexibility. These capabilities focus on responding to market changes by quickly adjusting the manufacturing operations and, hence, reduce the negative impact on the time and cost [66]. Firms work on improving the flexibility in many ways, including the product [66], product line [67], volume [68], production mix [69], labor [55], and delivery flexibility [69]. The high market volatility and complex industrial dynamics inherent in developed markets force firms located in such contexts to be more flexible [55]. This means that successful firms located in developed countries develop flexibility-related capabilities [7,56,70]. Recent research suggests that strategic business flexibility (i.e., agility) is not only useful in certain situations and contexts, but it is also financially profitable, even in stabile business environments [71].

The fifth group of capabilities are innovation-based. These capabilities focus on the development of new solutions, including products, services, processes, supply chains, and markets [72,73]. Typically, innovations are sustainable innovations (current actors benefit and keep their positions); however, the possibility of disruptive innovations exists (the entire industry and its actors change). Accordingly, business and organization models constantly need to be considered [1,74]. Northern Europe has gathered experience from industrial disruption, especially in mobile phones, where giants of their time, such as Ericsson and Nokia, eventually lost positions, sales, and profitability due to sudden stepwise technological-trajectory changes [75]. For firms located in developed countries, high innovativeness is considered a necessity to sustain a competitive advantage [76]. As mentioned above, successful firms in developed countries respond to the current competition through differentiation strategies. Some firms differentiate themselves through quality-related capabilities [2], which allow them to provide high-performing products, while others differentiate themselves through time-related capabilities that allow them to rapidly satisfy customer needs [76]. A third option is to differentiate on the basis of innovation-related capabilities [77]. For successful strategic innovation, Battistella et al. [1] include also social responsibility, which is rather close to sustainability. Nowadays, sustainability and business innovations are more and more intertwined [78].

The sixth group of capabilities concern sustainability. These capabilities focus on increasing the sustainability of the manufacturing operations in various ways. This means reducing the impact on the environment [67], consuming fewer natural resources [78], and generating limited emissions [79]. Sustainability can be described as the use of natural resources in such a way that the present generation meets its needs, without compromising the future generations' ability to meet their needs [60]. It is crucial for firms to develop environmentally friendly products and processes that minimize the consumption of natural resources or generate lower emission levels [67]. In the literature, it is not fully evident that these capabilities are critical for competitive manufacturing in developed countries; however, the pressure to perform in this regard on developed economies and their companies is increasing all the time [16,80]. The reason for this may be due to the complexity of the capabilities, along with the requirement for a mature approach towards sustainability, within manufacturing firms [60]. In general, companies progress in sustainability terms on the basis of their highest-performing capabilities, thus reaching goals that are easier to obtain [81]. The larger general implementation of sustainability throughout the organization is said to be dependent on networks, where the firm collaborates and has partnerships with other companies and actors [82].

## 3. Methodology

To study contemporary events in settings that are not possible to control, case studies are suitable [83] and were accordingly adopted in this research. In line with the purpose, firms with manufacturing located in developed countries were of specific interest. The developed country of Sweden was chosen, and three firms were selected (Table 1) through a purposing sampling, for geographical and limited-time reasons [84].

**Table 1.** Overview of case firms.

| Case Firms | Firm A | Firm B | Firm C |
|---|---|---|---|
| Location | Sweden | Sweden | Sweden |
| Founding year | 1958 | 1955 | 1974 |
| Ownership type | Corporation | Limited liability | Limited liability |
| Type | Manufacturing | Manufacturing | Manufacturing |
| Market | Global | Global | Global |
| Product | Forklifts | Suspension systems | Punched products |

**Table 1.** *Cont.*

| Case Firms | Firm A | Firm B | Firm C |
|---|---|---|---|
| Turnover (MSEK) | 2800 | 150 | 120 |
| Employees | 1100 | 40 | 60 |

The case study included a quantitative (questionnaire) and qualitative (workshop) evaluation of the critical capabilities for competitive manufacturing found in the extant literature (Figure 2). Combining both a quantitative and a qualitative evaluation was essential for increasing the research quality [85]. The case-study research approach is reminiscent, in parts, of that of Childerhouse and Towill [86], but with a lower number of cases. The respondents for the questionnaire were all the members of the management team of each case firm. The reasons for choosing the members of the management teams were that they provide a holistic view of the firm's manufacturing strategy. The quantitative evaluation was used as an input in the qualitative evaluation. The qualitative evaluation was completed through a workshop discussion (a separate workshop for each firm). The same participants that answered the questionnaire attended the workshops. In total, 19 participants from the three manufacturing firms participated in the study (Table 2).

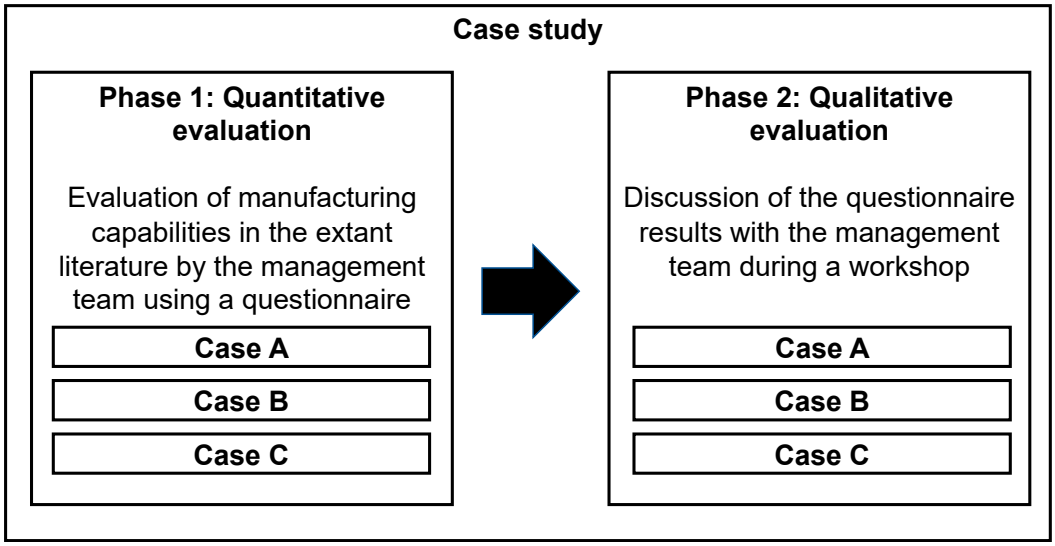


**Figure 2.** Overall research process.

**Table 2.** Overview of respondents in each case.

| Participants | Firm A | Firm B | Firm C |
|---|---|---|---|
| Plant manager | X | X | X |
| Production manager | X | X | X |
| R&D manager | X | X | |
| Quality manager | X | | X |
| Improvement manager | X | | |
| Purchasing manager | X | X | |
| Financial manager | | X | X |
| Marketing manager | X | X | X |
| Human resources manager | X | | |
| Total | 8 | 6 | 5 |

The design of the questionnaire took its departure from the framework of the manufacturing capabilities presented earlier. The questionnaire consisted of three parts. In the first part (introduction), background information regarding the purpose of the study and the questionnaire was presented. Additionally, the respondents provided work-related information (i.e., department, position, and work experience). In the second part (importance), the respondent rated how critical the capabilities are for the firm's overall competitiveness by using a scale of 1 (not important) to 5 (very important). In the third part (performance), the respondent rated how well the firm is currently performing with regard to the capability by using a scale of 1 (very low) to 5 (very high). The questionnaire was distributed during an initial meeting in each case firm. During this meeting, the respondents were given an opportunity to ask questions to avoid misinterpretations. The respondents individually answered the questionnaire during the meeting, and the questionnaires were collected directly on site.

The design of the workshop was divided into two parts. The first part was a presentation of the questionnaire results, while the second part was a discussion of the questionnaire results. These parts were conducted in parallel during the workshop. A set of predetermined open-ended questions were prepared and, depending on the emerging discussion, follow-up questions were expressed. The workshop discussion allowed the respondents to reflect on and validate the questionnaire results, as well as provide a qualitative explanation. The workshop discussion provided opinions and viewpoints regarding the results, which could not be obtained solely from the quantitative data.

The data analysis was performed in two stages. In the first stage, the data generated from the questionnaire were compiled in a spreadsheet, in which the answers from the questionnaire were gathered systematically in a table structure. Each case was analyzed separately, and the data were analyzed by calculating the mean value for each capability, which was illustrated in polar charts to facilitate visualization and the analysis process. The standard deviation for each capability was also calculated to identify the dispersion of values from the mean. A critical value of 4.00 was used to determine which capabilities were perceived as critical. Consequently, each capability that received a rate higher than four was deemed as critical in the analysis. To identify the critical improvement areas, the data regarding importance were compared against the data concerning performance, and the results were illustrated in polar charts. The difference between the importance and performance highlighted the improvement areas for each case. Improvement areas that exceeded the value 0.80 were perceived as critical. The complete analysis of the results from the questionnaire was used as a base for the workshop, in which respondents provided in-depth reflections regarding the questionnaire results.

In the second stage, the discussion from the workshops was analyzed in three steps. In the first step, field notes and recordings were reviewed, in which important viewpoints and quotes were highlighted. Each workshop was transcribed separately to avoid a mix-up of data. In the second step, the authors read through the transcribed notes to interpret and understand the data. In the final step, the data were categorized by using the framework as a reference point, and they were organized as information per each capability.

## 4. Empirical Findings

The evaluation of the twenty-two critical capabilities for competitive manufacturing found in the extant literature was evaluated for each individual case in terms of importance. The mean values were calculated for each capability, and the mean values that received a score higher than 4.00 were regarded as critical. The standard deviation was calculated to identify the dispersion of values from the mean. The results from each case were compared to identify similarities and differences with regard to the critical manufacturing capabilities. The evaluation of the critical improvement areas was conducted by evaluating the difference between the importance and performance for each capability in each individual case. The mean values were calculated for both the importance and performance, and a difference

value above 1.00 was regarded as critical. The results from each case were compared to identify similarities and differences between the cases.

### *4.1. Critical Manufacturing Capabilities*

Seven of the evaluated manufacturing capabilities were considered critical in the quantitative evaluation of Case A, twelve in Case B, and eight in Case C (Table 3). The overall ranking of the manufacturing capabilities was confirmed in the qualitative evaluation made during the workshop discussion for each case. The firm representatives agreed that the overall ranking was correct on an overall level, but that there are some important variations amongst the management team members shown in the standard deviation (SD). The firm representatives also agreed on the most critical capabilities extracted in the quantitative evaluation, and some of the respondent opinions on these capabilities are found in Table 4.

**Table 3.** Evaluation of manufacturing capabilities (bold indicates the most important capabilities in each case).

| Capability (Group) | Case A | Case B | Case C |
|---|---|---|---|
| Cost efficiency (C) | **Rank 1 (Mean 4.75, SD 0.46)** | **Rank 1 (Mean 4.60, SD 0.49)** | **Rank 2 (Mean 4.80, SD, 0.40)** |
| Resource efficiency (C) | Rank 9 (Mean 4.00, SD 0.76) | Rank 11 (Mean 4.20, SD 0.75) | Rank 14 (Mean 3.80, SD, 0.75) |
| Process efficiency (C) | **Rank 2 (Mean 4.38, SD 0.74)** | **Rank 5 (Mean 4.40, SD 0.49)** | **Rank 5 (Mean 4.20, SD, 0.40)** |
| Product quality (Q) | **Rank 6 (Mean 4.25, SD 0.46)** | **Rank 1 (Mean 4.60, SD 0.49)** | Rank 14 (Mean 3.80, SD, 0.75) |
| Process quality (Q) | **Rank 7 (Mean 4.25, SD 0.71)** | **Rank 1 (Mean 4.60, SD 0.49)** | **Rank 6 (Mean 4.20, SD, 0.75)** |
| Delivery dependability (Q) | Rank 8 (Mean 4.00, SD 0.00) | **Rank 1 (Mean 4.60, SD 0.49)** | **Rank 1 (Mean 5.00, SD, 0.00)** |
| Brand quality (Q) | Rank 15 (Mean 3.50, SD 0.53) | **Rank 11 (Mean 4.20, SD 0.75)** | Rank 13 (Mean 3.80, SD, 0.40) |
| Delivery time (T) | Rank 14 (Mean 3.63, SD 1.06) | **Rank 9 (Mean 4.20, SD 0.40)** | **Rank 4 (Mean 4.40, SD, 0.80)** |
| Time to market (T) | Rank 16 (Mean 3.50, SD 0.93) | **Rank 5 (Mean 4.40, SD 0.49)** | **Rank 6 (Mean 4.20, SD, 0.75)** |
| Product flexibility (F) | **Rank 2 (Mean 4.38, SD 0.74)** | **Rank 9 (Mean 4.20, SD 0.40)** | Rank 11 (Mean 4.00, SD, 1.10) |
| Production-mix flexibility (F) | Rank 10 (Mean 4.00, SD 1.07) | Rank 16 (Mean 3.60, SD 0.49) | Rank 19 (Mean 3.60, SD, 0.49) |
| Volume flexibility (F) | **Rank 2 (Mean 4.38, SD 0.74)** | Rank 13 (Mean 3.80, SD 0.40) | Rank 17 (Mean 3.80, SD, 0.98) |
| Product-line flexibility (F) | Rank 11 (Mean 3.63, SD 0.74) | Rank 13 (Mean 3.80, SD 0.40) | Rank 14 (Mean 3.80, SD, 0.75) |
| Labor flexibility (F) | Rank 12 (Mean 3.63, SD 0.92) | Rank 17 (Mean 3.60, SD 1.02) | Rank 9 (Mean 4.00, SD, 0.63) |
| Delivery flexibility (F) | **Rank 2 (Mean 4.38, SD 0.74)** | Rank 13 (Mean 3.80, SD 0.40) | Rank 17 (Mean 3.80, SD, 0.98) |
| Product innovation (I) | Rank 16 (Mean 3.50, SD 0.93) | **Rank 5 (Mean 4.40, SD 0.49)** | **Rank 6 (Mean 4.20, SD, 0.75)** |
| Service innovation (I) | Rank 22 (Mean 3.00, SD 1.31) | Rank 19 (Mean 3.00, SD 0.63) | Rank 21 (Mean 2.60, SD, 0.49) |

**Table 3.** *Cont.*

| Capability (Group) | Case A | Case B | Case C |
|---|---|---|---|
| Process innovation (I) | Rank 18 (Mean 3.38, SD 0.92) | Rank 18 (Mean 3.20, SD 0.75) | Rank 21 (Mean 2.60, SD, 0.49) |
| Technology innovation (I) | Rank 12 (Mean 3.63, SD 0.92) | Rank 19 (Mean 3.00, SD 0.63) | Rank 20 (Mean 3.60, SD, 1.02) |
| Market innovation (I) | Rank 19 (Mean 3.13, SD 0.83) | **Rank 8 (Mean 4.40, SD 0.80)** | Rank 9 (Mean 4.00, SD, 0.63) |
| Product sustainability (S) | Rank 20 (Mean 3.00, SD 0.53) | Rank 22 (Mean 2.60, SD 1.02) | **Rank 3 (Mean 4.40, SD, 0.49)** |
| Process sustainability (S) | Rank 21 (Mean 3.00, SD 0.53) | Rank 21 (Mean 2.80, SD 0.98) | Rank 11 (Mean 4.00, SD, 1.10) |

**Table 4.** Cross comparison of most important manufacturing capabilities.

| Capability (Group) | Case A | Case B | Case C |
|---|---|---|---|
| Cost efficiency (C) | "Cost is always a central aspect. What are our overhead costs in relation to the value we produce? Cost, cost and cost." (Plant manager) | "We are constantly working on reducing our costs." (Production manager) | "By increasing automation in production, we can achieve a higher cost reduction" (Plant manager) |
| Process efficiency (C) | "Investments in automation is increasingly important aspect for our business" (Improvement manager) | "Improving the productivity is very important and it is an aspect that is improved continuously" (Production manager) | "We have invested in automation to increase our productivity" (Production manager) |
| Process quality (Q) | "Our customers expect that the products correspond to the desired requirement" (Quality manager) | "Our research and development department works closely with our customers to ensure that customers receive the requested solutions" (Production manager) | "We talk a lot about conformance and reducing customer claims is very important." (Quality manager) |
| Product quality (Q) | "We work with the lean philosophy and strive to involve our employees to provide suggestions for improvements" (Improvement manager) | "Quality is a core aspect in our strategy and we aim at providing high performance products" (Plant manager) | |
| Delivery dependability (Q) | | "Providing our customers with accurate deliveries is critical and an area in which we perform well." (Plant manager) | "Dependability is a basic requirement. We cannot have low dependability and win orders." (Plant manager) |
| Time to market (T) | | "To outcompete our competitors, we have realized the importance of reducing the time it takes for us to launch new products" (Marketing manager) | "We strive to launch our new products faster than our competitors" (Marketing manager) |
| Delivery time (T) | | "Maintaining short lead-time to customers is important for our business." (Production manager) | "Our customers require short lead times and we are actively trying to reduce lead-times" (Production manager) |

**Table 4.** *Cont.*

| Capability (Group) | Case A | Case B | Case C |
|---|---|---|---|
| Product flexibility (F) | "This is an important area for us. We have a very high level of customization. We offer very much but at the same time it is very expensive." (R&D manager) | "We are keen on having a strong customer focus, which also reflects our strategy" (Production manager) | |
| Product innovation (I) | | "In order for us to develop as a firm and expand our sales, we need to develop new products" (Plant manager) | "In order for us to attract new customers, it is of great importance to consider innovation and the development of new products." (Marketing manager) |
| Resource efficiency (C) | | "In production, we strive to increase resource utilization" (Production manager) | |
| Brand quality (Q) | | "We work with advertising new products directly to our customers and at various trade fairs, in addition to our website" (Marketing manager) | |
| Volume flexibility (F) | "To be able to satisfy our customers we have to respond quickly to volume changes" (R&D manager) | | |
| Delivery flexibility (F) | "Our customers require a high degree of flexibility and we strive to be as agile as possible to the changes that occur" (Production manager) | | |
| Market innovation (I) | | "It has been difficult for us to identify new markets. Therefore, our focus has shifted more towards developing new products to current market segments." (Plant manager) | |
| Product sustainability (S) | | | "The sustainability aspect is a selling point for us, we believe we can sell more if we provide sustainable products." (Plant manager) |

In Case A, the cost-related capabilities are most prominent, closely followed by capabilities related to flexibility and quality (see Table 3). The heavy focus on cost, quality, and flexibility is an indication that the firm has a more traditional manufacturing strategy, since limited emphasis is placed on other capabilities that require a more novel approach, such as innovation and sustainability. To satisfy customer demands and remain competitive in this type of environment, a high level of flexibility, both in terms of product flexibility and volume flexibility, are required. Since the products are large and are intended to perform demanding work tasks, the quality aspects are critical to ensure safe products with a high level of performance.

In Case B, the most critical manufacturing capabilities belong to several groups (see Table 3), which indicate a focus on covering a wide range of capabilities (i.e., developing a wide set of skills). This firm emphasizes the development of new products, and these are enabled by maintaining close collaboration with customers to develop innovative and customized solutions. The flexibility-related capabilities received a low average, but also low SD (with the exception of labor flexibility). This may indicate a strong common agreement among the respondents that flexibility is less important than traditional manufacturing capabilities, such as cost and quality, despite the opposite usually being stressed in the literature (e.g., [66,68]) about the importance of this capability.

In Case C, the critical manufacturing capabilities belong to several groups, in which capabilities related to sustainability have an increased significance in this case (see Table 3). The firm has noted an increased demand for sustainable products and has strategically incorporated sustainability into daily operations to satisfy customer need and to increase competitiveness. Some capabilities related to flexibility (production-mix flexibility) and innovation (process and service innovation) received a low average and low SD. This may indicate that the respondents have a high level of agreement that capabilities related to innovation and flexibility are less important than delivery and cost, despite the opposite being argued for in the extant literature [13,14].

The critical manufacturing capabilities found in each of the three cases were compared with each other (Table 4). In total, fifteen capabilities were considered critical, meaning that the capability appeared in at least one of the three cases, while seven capabilities were not considered critical in any of the three cases. Regarding the fifteen critical capabilities, three appeared in all three of the cases, six capabilities appeared in two of the cases, while six capabilities appeared in one of the cases.

### *4.2. Critical Manufacturing Capabilities*

Nine improvement areas were considered critical in the quantitative evaluation of Case A, five in Case B, and six in Case C (Table 5). The overall ranking of the improvement areas was confirmed in the qualitative evaluation made during the workshop discussion for each case. The firm representatives agreed that the overall ranking was correct on an overall level, but that there are some important variations amongst the individual management team members. The firm representatives also agreed on the most critical improvement areas extracted in the quantitative evaluation, and some of the respondent opinions on these capabilities are found in Table 6.

**Table 5.** Evaluation of critical improvement areas (bold indicates the most important improvement areas).

| Capability (Group) | Case A | Case B | Case C |
|---|---|---|---|
| Cost efficiency (C) | **Rank 4 (1.25)** | **Rank 4 (1.00)** | **Rank 2 (1.60)** |
| Resource efficiency (C) | **Rank 3 (1.50)** | Rank 6 (0.67) | Rank 10 (0.40) |
| Process efficiency (C) | **Rank 5 (1.13)** | Rank 6 (0.67) | **Rank 3 (1.20)** |
| Product quality (Q) | **Rank 9 (0.87)** | Rank 10 (0.17) | Rank 10 (0.40) |
| Process quality (Q) | **Rank 6 (1.12)** | Rank 12 (0.00) | **Rank 6 (0.80)** |
| Delivery dependability (Q) | Rank 20 (−0.13) | Rank 12 (0.00) | **Rank 1 (2.00)** |
| Brand quality (Q) | Rank 10 (0.75) | **Rank 4 (1.00)** | Rank 18 (−0.40) |
| Delivery time (T) | Rank 17 (0.25) | Rank 17 (−0.17) | **Rank 3 (1.20)** |
| Time to market (T) | Rank 15 (0.37) | **Rank 1 (1.33)** | Rank 10 (0.40) |
| Product flexibility (F) | Rank 12 (0.63) | Rank 17 (−0.17) | Rank 18 (−0.40) |
| Production-mix flexibility (F) | **Rank 6 (1.12)** | Rank 12 (0.00) | Rank 18 (−0.40) |

**Table 5.** *Cont.*

| Capability (Group) | Case A | Case B | Case C |
|---|---|---|---|
| Volume flexibility (F) | **Rank 1 (1.88)** | Rank 17 (−0.17) | Rank 10 (0.40) |
| Product-line flexibility (F) | Rank 22 (−0.25) | Rank 6 (0.67) | Rank 18 (−0.40) |
| Labor flexibility (F) | **Rank 8 (0.88)** | Rank 9 (0.33) | Rank 7 (0.60) |
| Delivery flexibility (F) | **Rank 1 (1.88)** | Rank 17 (−0.17) | Rank 10 (0.40) |
| Product innovation (I) | Rank 15 (0.37) | **Rank 1 (1.33)** | Rank 10 (0.40) |
| Service innovation (I)<br>Process innovation (I) | Rank 17 (0.25)<br>Rank 13 (0.50) | Rank 11 (0.13)<br>Rank 12 (0.00) | Rank 17 (0.20)<br>Rank 22 (−0.60) |
| Technology innovation (I) | Rank 10 (0.75) | Rank 12 (0.00) | Rank 7 (0.60) |
| Market innovation (I) | Rank 13 (0.50) | **Rank 1 (1.33)** | Rank 10 (0.40) |
| Product sustainability (S) | Rank 20 (−0.13) | Rank 22 (−0.67) | Rank 7 (0.60) |
| Process sustainability (S) | Rank 19 (0.12) | Rank 21 (−0.33) | **Rank 5 (1.00)** |

**Table 6.** Cross comparison of most important improvement areas.

| Capability (Group) | Case A | Case B | Case C |
|---|---|---|---|
| Cost efficiency | "No matter what we try to improve, you look at how much such an improvement cost. Therefore, it's important to work with cost reduction." (Plant manager) | "Reducing costs in our operations is a constant target and something we need to continue to improve." (Production manager) | "We believe that this area should be improved further since it is an important aspect in our type of business." (Plant manager) |
| Process efficiency | "The process output is important to improve because it has an effect on delivery precision." (Production manager) | | "Process output is an area that we have invested in but there are still certain aspects in our daily operations that we believe should be developed further." (Production manager) |
| Process quality | "It is important to work with conformance. If we can ensure that our process produce the right quality over and over again, cost savings can be achieved." (Quality manager) | | "We are not performing as we should with regard to process quality and this is something that must be improved." (Plant manager) |
| Resource efficiency | "Resource productivity is an important aspect for us and it is also an area we strive to continuously improve" (Plant manager) | | |
| Delivery dependability | | | "Since this is a highly important aspect for our customers, additional improvement actions should be implemented to enhance our competitiveness." (Plant manager) |

**Table 6.** *Cont.*

| Capability (Group) | Case A | Case B | Case C |
| --- | --- | --- | --- |
| Time to market | | "We have a lot of products in our pipeline and it is crucial for us to launch our new solutions in time, before our competitors" (Research and development manager) | |
| Delivery time | | | "In order for us to secure customer loyalty, we have to offer fast and reliable deliveries." (Marketing manager) |
| Volume flexibility | "This is an area we need to improve in order to provide a higher level of flexibility" (Improvement manager) | | |
| Delivery flexibility | "Improving our delivery flexibility can allow us to adapt faster to changes from our customers" (Improvement manager) | | |
| Production-mix flexibility | "Adapting to changes is a key factor for us and we must have a high readiness in production" (Production manager) | | |
| Product innovation | | "Currently, we need to be better at developing new products and identifying new markets, it is our long-term challenge." (Plant manager) | |
| Market innovation | | "We have previously made attempts to identify new markets, without any major success." (Plant manager) | |
| Product quality | "The customers require high quality products and we as a firm must improve this and aiming for being a high-performance supplier". (Marketing manager) | | |
| Brand quality | | "We need to enhance our brand value by finding out important values for our customers and communicate in the best possible way." (Marketing manager) | |

**Table 6.** *Cont.*

| Capability (Group) | Case A | Case B | Case C |
|---|---|---|---|
| Labor flexibility | "Have a staff with multi-skills is becoming more and more important and we need to further improve this in our operations. (Production manager) | | |
| Process sustainability | | | "Process sustainability is becoming increasing important and we must improve our performance here." (Production manager) |

In Case A, there is an overrepresentation of cost-related improvement areas, which is an indication that cost-related capabilities are crucial (Table 5). The capability with the highest improvement potential is volume flexibility, as there is an increasing demand for flexibility with regard to both volume and customization. However, the cost-related capabilities are the group in which most improvement efforts should be placed, since all cost-related capabilities are regarded as critical improvement areas. This is consistent with what the firm perceives to be most critical, considering that the firm has a cost-oriented approach. The ability to provide conformed products is a critical improvement area since it is often a prerequisite for reducing other types of costs. Therefore, the firm aims to ensure the right quality from the outset, in every process.

In Case B, the most prominent improvement areas are linked to capabilities related to innovation and time (Table 5). These capabilities are critical to improving the enhancement of competitiveness. Innovation-related capabilities are predominant in terms of critical improvement areas for Firm B. To increase competitiveness, greater emphasis on the development of new products and the identification of new markets is required. This is the main challenge for the firm and is, simultaneously, the area with the highest improvement potential. The time to market for new products is also regarded as a critical improvement area.

In Case C, the improvement area with regard to delivery dependability is considerably higher, which is an indication that this area has the highest potential for improvement to strengthen competitiveness (Table 5). Dependability is regarded as the most critical improvement area, as the firm has a wide customer base operating in different market segments, making it crucial to secure dependable deliveries. The reduction in the total cost is perceived as a critical improvement area. Therefore, it is important to continuously work with cost savings to provide lower prices.

The critical improvement areas found in each of the three cases were compared with each other (Table 6). In total, sixteen improvement areas were considered critical in the cases, meaning that the improvement area appeared in at least one of the three cases, while six improvement areas were not considered critical in any of the cases. Regarding the sixteen improvement areas, one appeared in all three of the cases, two capabilities appeared in two of the cases, while thirteen capabilities appeared in one of the cases.

## 5. Discussion

Previous studies suggest that cost-related capabilities are the most critical in terms of achieving a higher level of competitiveness [50–52]. As a contribution to this specific issue, this study supports that the cost aspect is still very critical for competitiveness, since capabilities related to cost (i.e., cost efficiency and process efficiency) are regarded as critical and are prominent in all three cases. Moreover, the case studies revealed an in-depth perspective about the cost goals and capabilities of process redesign. As induced from the empirical findings, firms still regard cost as a central element of an organization, and

efforts to continuously reduce cost are implemented through various improvement efforts (e.g., automation and lean implementation). It is also evident that firms in developed countries regard the cost-related improvement areas as important, which could also imply that the firms have not yet reached a desired level of performance in terms of cost, or that the cost pressure increases over time. Earlier research has emphasized the importance of costs in developed-economy manufacturing, and it is seen in Gold et al. [16] that these cost objectives ought to be reached by the redesign of processes. Our research supports these findings further.

A second contribution derived from the field data is with regard to the connection between the concepts of cost-based capabilities and quality-based capability. According to our results, there is a type of hierarchical behavior as to the coexistence of these two types of capabilities. Manufacturing firms located in developed countries also tend to emphasize product quality, process quality, and delivery dependability. According to Johansson and Olhager [13] and Lund and Steen [14], quality is perceived to be a market qualifier, which could be applied to firms located in developed countries. Bortolotti et al. [49] also argue for the importance of quality as a basis for capabilities in manufacturing. The empirical findings suggest that firms strive to continuously improve the quality-related capabilities, since these capabilities have a direct impact on the cost-related capabilities. This is an indication that firms in developed countries have developed a high-quality standard and, therefore, capabilities related to quality are not perceived to be the most critical to improve. Quality is an area that firms continuously improve by implementing cost-reduction strategies (e.g., lean) that can increase cost and resource efficiency, which can generate a positive impact on the product and process quality as well. Depending on the firm's business strategy, firms located in developed countries will either primarily focus more on cost than quality, or vice versa.

Once the development of capabilities related to cost and quality have reached the desired level, firms located in developed countries can turn the focus towards developing other capabilities. Since the manufacturing capabilities are cumulative by nature, it is essential that the capabilities are built on each other to achieve a successful strategy [8]. The empirical findings of this study support the cumulative theory of capabilities (e.g., [8,16,47,48]). The sequence of capabilities that are addressed following cost and quality will vary on the basis of the business strategy of the firm. This study suggests that capabilities related to time and flexibility have a higher probability of being developed and improved next in developed countries. This may be due to a fast-changing and turbulent business environment, in which customers require shorter lead times and a higher degree of customization [53,87]. However, earlier research (such as Gold et al., [16]) does not see flexibility as that important in developed-country manufacturing. It is merely an issue of emerging countries.

A third contribution derived from the empirical results concerns the concept of innovation capabilities, which has a close relationship with the long-term goals of technology adoption. As stated previously, innovation-related capabilities are regarded as proactive, since developing new products might result in new technology and new production processes [1,14,63,77,88,89]. The empirical findings suggest that firms primarily focus on developing the traditional manufacturing capabilities. Once the development of these capabilities has reached a satisfactory level, firms located in developed countries shift the focus towards developing more novel capabilities (e.g., innovation). To adapt to the rapid growth of digitalization and the increasing demand for intelligent products, firms in developed countries must start to regard innovation capabilities as a necessity to reach long-term competitiveness. One potential indicator of future change is Case B of this study, which regards product and market innovation, as well as time to market, as the most important capabilities; these were closely followed by cost efficiency and brand quality.

Finally, within the reality of the case studies performed, there is a limited emphasis on the sustainability-related capabilities that are presented in the literature. First, it is important to highlight that there is a lack of research concerning both product and process

sustainability. Longoni and Cagliano [60] state that sustainability-related capabilities can contribute to higher business and operational performance, which could increase the competitiveness of a firm. The reduction in natural resources and emission levels during the manufacturing process will also positively impact capabilities related to cost and quality [60,67]. As a fourth contribution, it is evident in the empirical findings that capabilities related to sustainability are gaining more attention. Firms are slowly starting to focus more on minimizing their environmental footprint, while simultaneously using it as a means to gain a competitive advantage. However, considering that sustainability is still a relatively novel area, it is not perceived to be critical enough to improve, compared to other areas, for firms located in developed countries. The findings could indicate the start of a cycle, where companies are receiving increasing pressure for sustainability [16,80].

## 6. Conclusions

This research aimed to evaluate the critical capabilities and improvement areas for competitive manufacturing in a developed-country environment. The research used a multiple-case-study approach that included three manufacturing firms located in Sweden. The case study included a quantitative and a qualitative evaluation of the critical manufacturing capabilities found in the extant literature. The research reveals fifteen critical capabilities and sixteen improvement areas for competitive manufacturing in a developed-country environment. To be competitive in developed countries, it is vital to improve capabilities related to time, flexibility, innovation, and sustainability. However, irrespective of the targeted capabilities, they must contribute to cost efficiency. The efforts to develop the capabilities related to innovation and sustainability may be expensive in the short term, however they can provide better cumulative results and competitiveness in the long term. The reported findings provide guidelines for managers in developed countries on how to create competitiveness and on possible improvement areas.

There are some limitations associated with the research findings. The results are based on three manufacturing firms located in Sweden, which does not necessarily represent all kinds of developed countries. The generalizability is thus limited, both by the case-study method and by the geographical aspect. Hence, it is necessary to investigate the same constructs on a larger scale, including additional cases from the same and other contexts. Moreover, in the case selection, the study did not consider variables, such as size and position in the supply chain. These variables might have had an influence on the empirical results if they were considered. It can be assumed that the critical capabilities and improvement areas would have had greater credibility if the study was limited to a few variables.

As a practical implication, managers should pay attention to these capabilities to adapt their manufacturing according to the local demands, in terms of quality demands and cultural changes with regard to sustainability goals. The set of concepts on the critical capabilities characterized through the case studies can provide ideas to answer these potential demands. To be competitive, it is important to introduce improvements with regard to products and raw materials, flexibility, innovation, and sustainable processes. However, these practices need to contribute, continuously and jointly, to some type of cost reduction.

For further research, it is important to evaluate the critical capabilities and improvement areas in different countries that represent different developed countries, and thus provide a greater opportunity for generalization. Additionally, a larger sample of companies can be involved based on various selection criteria (for example, size, position in the supply chain, and type of production). This would allow for a more in-depth comparison of the results on the basis of different criteria. The final proposal for further research is to conduct an evaluation of the critical capabilities and improvement areas in developing countries for comparison purposes. Conducting a study in a different context could enable the possibility for a greater understanding of the context in question and provide an opportunity to identify similarities and differences between different manufacturing environments.

**Author Contributions:** Conceptualization, I.A., J.A. and P.H.; Data curation, I.A., J.A., P.H. and O.-P.H.; Formal analysis, I.A., J.A. and P.H.; Investigation, I.A., J.A., P.H. and O.-P.H.; Methodology, I.A., J.A., P.H. and M.L.P.; Project administration, I.A., J.A. and P.H.; Resources, I.A., J.A. and P.H.; Software, I.A. and J.A.; Supervision, P.H. and O.-P.H.; Validation, I.A., J.A., P.H. and O.-P.H.; Visualization, I.A., J.A. and P.H.; Writing—original draft, I.A., J.A., P.H. and O.-P.H.; Writing—review & editing, I.A., J.A., P.H., M.L.P. and O.-P.H. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Not applicable.

**Data Availability Statement:** Dataset available from corresponding author by request.

**Conflicts of Interest:** The authors declare no conflict of interest.

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