

An analysis of critical operations capabilities in a high cost environment: a multiple case study

Cinzia Sansone (cinzia.sansone@ju.se)

*Department of Industrial Engineering and Management
School of Engineering, Jönköping University, Sweden*

Per Hilletoft

*Department of Industrial Engineering and Management
School of Engineering, Jönköping University, Sweden*

David Eriksson

*Department of Industrial Engineering and Management
School of Engineering, Jönköping University, Sweden*

Claudia Pinna

*Department of Management, Economics and Industrial Engineering
Politecnico di Milano, Italy*

Abstract

Several operations capabilities frameworks have been proposed in the literature. These frameworks do not take specific contexts into consideration, i.e. high cost environment. The purpose of this study is to analyse critical operations capabilities in a high cost environment. A multiple case study, including two Swedish companies, was conducted. The starting point was an existing framework of operations capabilities. The findings revealed that all the dimensions and most of the capabilities included in the framework were critical. New capabilities were identified: flow efficiency and employee flexibility. The findings confirmed the validity of the existing framework in a high cost environment.

Keywords: Capability, High cost environment, Case study

Introduction

In order to maintain a long term competitive advantage, firms need to develop operations capabilities (Ward et al., 1996). This development supports the achievement of highest level of performance along different dimensions such as cost, quality, delivery and flexibility (Boyer and Lewis, 2002). Operations capabilities is a popular research area and several frameworks have been proposed. However, the existing frameworks do not take specific manufacturing contexts into consideration, for instance a high cost environment.

The environment in which a firm compete affects the formulation of the operations strategy (Bradi et al., 2000); specifically, the identification and development of different operations capabilities. Operations capabilities is a dynamic research process, which is

also context dependent. Thus, it is of fundamental importance to identify operations capabilities in specific contexts. Considering the relocation process, from high to low cost environments, that has been taking place during the last decades (Wiesmann et al., 2017), it is of particular interest to conduct studies with regard to the formulation of winning operations strategies in a high cost environment.

The purpose of this study is to fulfil this research gap by analysing critical operations capabilities in a high cost environment. In order to satisfy this purpose, the following research questions were formulated: ‘What are the critical operations capabilities *dimensions* in a high cost environment?’ and ‘What are the critical *operations capabilities* in a high cost environment?’. The first research question aims to identify the dimensions commonly accepted by companies within a high cost environment. The second research question aims to identify the operations capabilities commonly accepted by companies within a high cost environment in the different dimensions.

In order to answer these research questions, a multiple case study, including two Swedish manufacturing companies, was conducted. The starting point in this case study was an existing framework of operations capabilities (Sansone et al., 2017) which was analyzed in the specific context of a high cost environment.

Theoretical Framework

Firms can only outperform competitors if they are able to create a sustainable competitive advantage (Porter, 1996). This is achieved by organizing the firm around how customer value is created, how customer value is delivered, and how these efforts are coordinated and managed (Hilletoft, 2010). This in turn, depends on the ability to develop operations capabilities which consistently provide superior value to the customers (Hilmola et al., 2015).

The competitive advantage is formulated in the business strategy and should later be transferred to the operations strategy (Frohlich and Dixon, 2001). The operations strategy consists of two elements (Dangayach and Deshmunk, 2001). The first element refers to the objective and goals that the operations function must accomplish (referred to as priorities) (Miller and Roth, 1994). These priorities are wished capabilities, i.e. capabilities that a firm wants to have in the future or on which emphasis should be placed in the future (Größler and Grübner, 2006). In other words, these priorities will guide the management actions towards the development of appropriate operations capabilities (Koufteros et al., 2002).

The second element refers to the decisions that a firm makes, which determine the actual capabilities of the operations system (Miller and Roth, 1994). Given the specified priorities and available resources the firm makes different decisions, and these result in some operations capabilities (Größler and Grübner, 2006). These operations capabilities are realized capabilities, i.e. capabilities that are attained after the implementation of management actions (Koufteros et al., 2002).

The framework of operations capabilities analyzed in this study is based on previous frameworks (e.g. Miller and Roth, 1994; Frohlich and Dixon, 2001), but it has been expanded through a systematic literature review (Sansone et al., 2017). The framework consists of seven dimensions of operations capabilities: cost, quality, delivery, flexibility, service, innovation and environment (Table 1). The dimensions include two or more specific operations capabilities. In total, 21 capabilities are included in the framework.

Table 1 - Framework of operations capabilities (Sansone et al., 2017)

Dimension	Capabilities	Definition
Cost	Total cost	Ability to reduce production and distribution costs.
	Productivity	Ability to optimize the utilization of manufacturing resources (machines, equipment, and labor) and increase their output.
Quality	Performance	Ability to provide products and processes at the desired high level of performance.
	Conformance	Ability to offer products and manufacturing processes that correspond to the specifications, which help to ensure defect free products.
	Durability	Ability to offer products that withstand hard use over an extended period of time.
Delivery	Dependability	Ability to provide reliable delivery by meeting schedules or keeping promises.
	Speed	Ability to provide fast delivery and respond quickly to customer orders.
Flexibility	Volume flexibility	Ability to change production volume and respond rapidly to volume changes.
	Production mix flexibility	Ability to change the range of products in the production and respond rapidly to changes.
	Customization flexibility	Ability to adjust the product according to customer requirements and needs.
	Broad product line	Ability to offer a wide range of products, with a large number of features.
Service	Customer service	Ability to add value to the product by providing product information and making the product easily available and obtainable.
	After sale service	Ability to add value to the product after the purchase by providing effective after sale services, and delivering appropriate technical assistance and product support.
	Advertising	Ability to market and promote the product, and improve the company's image.
	Broad distribution	Ability to make the product available to a larger group of customers.
Innovation	New product	Ability to develop and introduce updated or novel products to the market.
	New technology	Ability to develop and implement updated and novel technologies.
	New service	Ability to develop and present updated and novel services to the customers.
	New market	Ability to create, expand and develop products and services, as to reach additional groups of customers.
Environment	Environmental friendly products	Ability to produce products with a reduced negative or even positive environmental impact.
	Environmental friendly processes	Ability to have processes with a reduced negative or even positive environmental impact.

By aligning its operations capabilities with the environmental requirements, a firm can optimize its operational and organizational performance (Ho, 1996). As stated above, operations capabilities are mutual and can change based on different contexts and environments. All manufacturers are, to some extent, dependent on their environment (Ho, 1996). The manufacturing relocation, from high to low cost environments, taking place in the past decades, could be considered as a consequence of this dependency.

Research Methodology

The research process was built on the analysis of an existing framework of operations capabilities in the specific context of a high cost environment. In order to analyse the

framework in a real setting and a specific context, a multiple case study was conducted. Case study research allows the investigator to focus on a ‘case’ and retain a holistic and real-world perspective (Yin, 2014). In order to create compelling and robust findings, as well as to allow a cross-case analysis, two case companies were included. The companies originate from Sweden and belong to the manufacturing industry. The case companies were selected through theoretical sampling and the unit of analysis was limited to the ‘realized operations capabilities’ developed in the case companies.

Data Collection

Managers from middle and senior management, working in different departments, were targeted for this study. Data was collected through semi-structured interviews, so as to both ensure an interview on the topic at hand and to allow the researchers to pursue new information that arise during the interview. The interviews are summarised in Table 2.

Table 2 Conducted semi-structured interviews

Interview	Respondent	Company	Time	Investigator
1	Manager Material Handling & Logistic	Alfa	60 min	I1+I2
2	Supply Chain Specialist	Alfa	60 min	I1
3	Supply Chain Manager	Alfa	60 min	I1+I2
4	Product Introduction Manager	Alfa	60 min	I1+I2
5	Head of Production Line	Alfa	60 min	I2
6	Head of Global Supply Chain Management.	Alfa	60 min	I1+I2
7	Manager Logistics	Alfa	60 min	I1+I2
8	Manager Production Engineering	Alfa	60 min	I1+I2
9	Head of Product Introduction Management	Alfa	60 min	I1+I2
10	Manager Market Planning	Alfa	60 min	I1+I2
11	Senior Supply Chain Developer	Alfa	60 min	I1+I2
12	Operations Manager	Beta	60 min	I1+I2
13	Enablers Director R&D	Beta	60 min	I1+I2
14	Quality Manager	Beta	60 min	I1+I2
15	Process and Production Development Manager	Beta	60 min	I1+I2
16	Director Global R&D	Beta	60 min	I1+I2
17	Logistic Manager	Beta	60 min	I1+I2
18	Finance Director	Beta	60 min	I1+I2
19	Factory Controller	Beta	60 min	I1+I2
20	Controller	Beta	60 min	I1+I2
21	Production Manager	Beta	60 min	I1+I2
22	Supply Chain Manager	Beta	60 min	I2+I3
23	Production Development Engineer	Beta	60 min	I2+I3

In total, 11 interviews were conducted at *Alfa* and 12 at *Beta*. The interviews were carried out at the respective companies, and lasted for approximately 60 minutes. The questions asked during the interviews can be divided into different sections: general information of the respondent and company, operations strategy and operations capabilities, improvement strategies and benchmarking.

Secondary data was also collected from the companies, which included ‘documents’ and ‘observations’. The investigators also visited the manufacturing facilities to study the production systems of the companies, which made it possible to contextualize the findings from the interviews and the secondary data. Moreover, additional meetings and workshops were carried out with the managers of the two companies involved. During these meetings and workshops, the findings were presented and discussed.

Data Analysis

The analytic strategy adopted in this study is based on the link between the data collected in the case studies and the selected framework of operations capabilities. The framework shaped, led and gave a sense of direction when analysing the data. The first step was to develop a case study description for each of the companies. Each interview was recorded and transcribed. The transcriptions were analysed by multiple investigators and relevant information was extracted and included in the case study description. The case study description contained a section concerning the dimensions of operations capabilities, a section about operations capabilities and a section about additional operations capabilities or additional general information relevant for the study. As a result, it was possible to gain an overall view of the critical dimensions and operations capabilities in each case company. Once the case study description was developed, a cross-case analysis was initiated. The analysis focused on finding patterns, commonalities and differences between theory and case companies. This was achieved by comparing data across columns/cases for each of the dimensions and operations capabilities. Moreover, the data collected from the additional meetings and workshops were analysed and it added relevant knowledge and information to this study.

Research Quality

Validity and reliability are criteria for assessing the quality of research (Yin, 2014). In this study, construct validity was assured by adopting triangulation. Data triangulation was achieved by using different data sources including interviews, observations and documents, and investigator triangulation was achieved since several investigators were involved in the data collection and analysis processes. To ensure the external validity of this study, two case studies were selected. The reliability of this study was enhanced by the development of a case study description for each one of the case companies. The case study description included all the relevant information for this study.

Findings

The main dimensions of operations capabilities discussed were: cost, quality, delivery, flexibility, service, innovation and environment. These dimensions included one or more capabilities each, for a total of 21 operations capabilities. In the case company *Alfa*, all of the operations capabilities *dimensions* (included in the framework) were considered critical; however, only 17 of the operations capabilities (included in the framework) were considered critical. The operations capabilities, not discussed during the interviews, were: ‘after sales service’, ‘broad distribution’, ‘new service’ and ‘new market’. In the case company *Beta*, all of the operations capabilities *dimensions* (included in the framework) were considered critical; however, only 18 of the operations capabilities (included in the framework) were considered critical. The operations capabilities, not discussed during the interviews, were: ‘advertising’, ‘new service’, ‘new market’. In addition, in the case company *Beta* two more operations capabilities (not included in the framework) were identified. In Tables 3 and 4, all the findings are presented.

Two new capabilities were discussed during the interviews in the company *Beta*. The first capability was named ‘flow efficiency’ and it was included in the cost dimension. During the interviews, this capability was mentioned and discussed by the respondents and related to the concept of resource efficiency and productivity in the lean practice. The second capability was named ‘employee flexibility’ and it was included in the flexibility dimension. During the interviews, this capability was mentioned and discussed by the respondents and related to the concept of high skilled employees as part of an effective learning organization.

Table 3 Empirical findings in case company Alfa

Capability	Description	Interview
Total cost	Alfa focuses on reducing the total cost in the entire production line. The total cost has been reduced through automation and implementation of Lean.	2, 7, 8, 9, 11, 12, 13
Productivity	Alfa consider productivity as a critical factor in order to be competitive in Sweden. Hence, since 2008, the company is continuously improving their production by implementing lean methods. The latter in combination with investment in automation and new technology support the improvement of productivity about 3%-5% every year.	3, 5, 6, 8
Performance	Alfa adopts different quality measurements methods. These methods help to keep track of the product performance and support improvements.	2
Conformance	Alfa believes that offering good quality products, defect free and conforming with the specifications, help to gain more trust from the customers. The customers' trust is an important factor for winning the competition.	6, 8
Durability	Alfa constantly works on maintaining the life cycle of the products as long as possible. Offering high quality and durable products is part of its operations strategy. the company's products have a life cycle of 10-15 years.	8
Dependability	Alfa focuses on providing the product to the customers in the right time and keep the promises. Different measuring methods are adopted to fulfil this goal.	2, 17, 12, 13
Speed	Alfa focuses on speed in order to provide fast delivery. The company is constantly working on reducing the lead time through lean practices. Providing fast delivery is fundamental for being more flexible and satisfy the customer demand.	7, 12, 13
Volume Flexibility	Alfa works on increasing volume flexibility, this capability together with production mix flexibility, customization flexibility and broad product line, is critical for being competitive in Sweden.	2
Production Mix Flexibility	Alfa work on improving production mix flexibility, through modularization.	2, 3, 4, 5, 13
Customization Flexibility	Alfa offers customized products to the customers, this is done through modularization. Customization is important in order to be competitive in Sweden.	4, 5, 13
Broad Product Line	Alfa works on increasing broad product line and offering a wider range of products, through modularization.	5, 13
Customer Service	Alfa constantly works on offering good service to the customers. Offering a good customer service is one of their main goals.	8
Advertising	Alfa constantly works on improving its image in the market. The company built a good company's image by always satisfying its customers and offer good quality products over the years.	7, 10
New Product	Alfa believes that developing and introducing new products and technologies in the market is a critical capability for being more competitive in Sweden.	3, 10
New Technology	This is the reason why the company invests every year in its R&D department, which has the goal of creating new products and new technologies.	3, 4, 6, 8, 10
Environmental Friendly Products	Alfa invests on its R&D department, which has, among others, the goal of creating new products and technologies in respect of the environment. The company believes that in a high cost environment, an important customers' requirement is to have a sustainable product.	4, 8, 10
Environmental Friendly Processes	Alfa currently adopts different methods for measuring and reducing the production and processes' consumptions.	2, 4, 8

The reported findings were presented to the managers involved in the interviews during a workshop. During this event, the managers discussed the findings in relation to the existing framework of operations capabilities. It was revealed that the managers did consider all of the capabilities included in the framework as critical, even if not addressed during the conducted interviews. However, different emphasis was put on the different capabilities. They also confirmed the need for the additional capabilities.

Table 4 Empirical findings in case company Beta

Capability	Description	Interview
Total cost	Beta works on decreasing the total cost in all the production line through a continuous improvement. This is part of Lean and Six Sigma practices, which have been implemented in the company since 2005.	2, 3, 4, 5, 6, 7, 8, 10, 11
Productivity	Beta works on increasing productivity through Lean.	4, 5, 6, 7, 12
Flow Efficiency	Beta works on improving flow efficiency. This is part of Lean and Six Sigma practices. A lot of work has been put on reducing wastes in order to increase flow efficiency. Flow efficiency should be also included in the framework of operations capabilities.	2, 3, 11
Performance	Beta believes in the importance of offering high-quality products. The company adopts different methods to measure the quality of their products.	5, 8, 9, 11, 12
Conformance	Beta is currently adopting "Kraljik methods" to select the most qualified components for their products. The company has really high requirements when it comes to offer products corresponding to the specifications.	7, 8
Durability	Beta offers high quality products, this ensure their durability.	5
Dependability	Beta works on improving dependability in the delivery. For the company, it is important to provide to the customer the right product at the right time. Respect the delivery schedules is fundamental.	2, 4, 5, 6, 7, 8, 12
Speed	Beta is able to have fast delivery. The company focuses on keeping a short lead time, this helps the company to increase delivery speed. This is done through the implementation of Lean.	5, 6, 8, 9, 10
Volume Flexibility	Beta has high volume and unstable demand. This requires the company to improve volume flexibility. The company believes that by increasing volume flexibility, it is possible to decrease manufacturing costs.	4, 6, 10
Production Mix Flexibility	Beta offers high variety of products. Due to the difficulty of managing the demand, the company works on improving production mix flexibility.	4, 6
Customization Flexibility	Beta has high demand concerning customized products. Hence, the company works on improving customization flexibility.	5, 10
Broad Product Line	Beta believes that having a high broad product line will require a specific supply chain design. The company is working on decreasing the number of product variations, to have a better flow efficiency and reduction in cost.	7, 8, 10
Employee Flexibility	Beta is continuously investing on the education and training of its employees. It is important to educate the employees to be multi-skilled. This will increase their flexibility.	2,6,8,9,10,11
Customer Service	Beta works on improving customer service, it is important that the customers are satisfied. The company works on making the product easily available to the customer and start using it as soon as possible.	3,4,5,7,12
After Sale Service	Beta works on providing to the customer a good after sale service. For the company, this is a value-adding factor.	4,5,7,12
Broad Distribution	Beta works on improving the distribution capability. There are different problematics that the company is facing concerning distribution. The company believes that, in order to improve this capability, is important to be closer to the customers. This is a big challenge for the company.	4,5,6
New Product	Beta introduces each week from 5 to 15 new products. In order to be successful, the company works with incredibly accurate planning. In this way, when new products are developed, new testing systems and technology are developed as well. However, a drawback is that this process requires high cost and time.	4,6,9
New Technology	Beta works on developing new technology. The main goal is to increase the level of automation. Increased level of automation will lead to increased productivity (decreased in flexibility).	3,5,9
Environmental Friendly Products	Beta uses resources for their products and implement processes, which do not have any negative effect on the environment. Different methods have been used to improve constantly the products and the processes, in order to reduce the company's consumptions.	7
Environmental Friendly Processes		7

Discussion

The systematic search for cross-case patterns is a key step in case research (Voss, 2002 p. 214). In this study, the data was analysed based on the data collected in the case companies *Alfa* and *Beta* and the framework of operations capabilities presented in the literature. The cross-case patterns are summarized in Table 5.

Table 5 Analysis of the empirical findings in relation to the literature

Dimension	Capabilities	Definition	Alfa	Beta	Lit
Cost	Total cost	Ability to reduce production and distribution costs.	X	X	X
	Productivity	Ability to optimize the utilization of manufacturing resources (machines, equipment, labours) and increase their output.	X	X	X
	Flow efficiency	Ability to have an optimized movement of products through all processes and operations		X	
Quality	Performance	Ability to provide products and processes at a desired high level of performance.	X	X	X
	Conformance	Ability to offer products and manufacturing processes that correspond to the specifications, which help to ensure defects free products.	X	X	X
	Durability	Ability to offer durable products that withstand hard use over an extended period of time.	X	X	X
Delivery	Dependability	Ability to provide reliable delivery by meeting schedules or keeping promises.	X	X	X
	Speed	Ability to provide fast delivery and respond quickly to customer orders.	X	X	X
Flexibility	Volume Flexibility	Ability to change production volume and respond rapidly to volume change.	X	X	X
	Production Mix Flexibility	Ability to change the range of products in the production and respond rapidly to changes.	X	X	X
	Customization Flexibility	Ability to adjust the product according to customer requirements and needs.	X	X	X
	Broad Product Line	Ability to offer a wide range of products, with a large number of features.	X	X	X
	Employee flexibility	Ability to which employees possess skills, which enable the firm to pursue strategic decisions		X	
Service	Customer Service	Ability to add value to the product by providing product information and making the product easily available and obtainable.	X	X	X
	After Sale Service	Ability to add value to the product after the purchase by providing effective after sale services, and delivering appropriate technical assistance and product support.		X	X
	Advertising	Ability to market and promote the product, and improve the company's image.	X		X
	Broad Distribution	Ability to make the product available to a larger group of customers.		X	X
Innovation	New Product	Ability to develop and introduce updated or novel products to the market.	X	X	X
	New Technology	Ability to develop and implement updated and novel technologies.	X	X	X
	New Service	Ability to develop and present updated and novel services to the customers.			X
	New Market	Ability to create, expand and develop products and services, as to reach additional groups of customers.			X
Environment	Environmental Friendly Products	Ability to produce products with a reduced negative or even positive environmental impact.	X	X	X
	Environmental Friendly Processes	Ability to have processes with a reduced negative or even positive environmental impact.	X	X	X

The cross-case analysis revealed that not all the capabilities were discussed during the interviews. Based on the semi-structured interviews, not all the capabilities included in the framework were considered critical by the companies involved. In the service dimension, 'after sale service' and 'broad distribution' were not considered critical in company *Alfa*, while company *Beta* did not consider critical the capability 'advertising'. In the innovation dimension, 'new service' and 'new market' were not discussed in any of the company involved. However, this result could be related to the involvement of respondents that were belonging mainly in the production and supply chain area. The study revealed that two more capabilities were identified, which were not included in the framework of operations capabilities. These capabilities were identified and discussed in company *Beta* and were considered critical.

Considering the data collected through the workshop carried out with all the managers involved in the interviews, all the capabilities included in the literature were considered critical in a high cost environment. However, each company highlighted the different emphasis on each one of them.

Conclusion

The purpose of this study is to fulfil this research gap by analysing critical operations capabilities in a high cost environment. The purpose was addressed by applying a general framework to this specific context. From the data collected through the multiple case study, this study developed an updated framework, introducing two new operations capabilities not previously recognized. All the dimensions of operations capabilities identified in the literature were considered critical by the companies included. However, not all the operations capabilities were considered critical. Still, an additional workshop with the managers who participated to the interviews, revealed that all the capabilities included in the framework were considered critical, but with different emphasis. This entails that even though this research has expanded on current knowledge, more research is still needed to form a complete opinion of the field (Eriksson, 2015).

This study contributes theoretically by identifying critical operations capabilities in a high cost environment and practically by creating an overview for managers and practitioners of critical operations capabilities in a high cost environment. As in any research, there are limitations to the findings generated. Research findings based on two case companies considered in this study may not be valid for other industries and other contexts. There are other factors that may be influencing the identification and development of operations capabilities. These factors could be: the context in which a company works, the size of a company, the industry in which the company operates. All these factors could be considered in future research. Therefore, it could be beneficial for further research to conduct multiple case studies that consider bigger sample of companies and, different sizes, sectors and contexts.

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