

Criteria Considered in a Manufacturing Reshoring Decision – A Multiple Case Study

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Abstract. The manufacturing reshoring phenomenon has received more attention in the academic and business literature in recent years. Due to the newness of the phenomenon, there is a lack of knowledge about how these decisions were made. This research provides a theoretical framework by reviewing literature on possible criteria that are considered in a manufacturing reshoring decision. The criteria are categorized into six categories including competitive priority, resource, strategy, context, preference and global condition. A multiple case study methodology is used to identify the criteria and compare them with the theoretical framework. The findings indicate that total cost is the most common criteria considered and each case company has followed its own cost analysis techniques. Other criteria considered by all case companies were inventory cost, transportation cost, switching cost, delivery lead times, proximity to customer and availability of manufacturing technology. The research concludes that manufacturing reshoring is a holistic decision with criteria occurring at all categories in the theoretical framework. This contributes to the knowledge of reshoring decision-making and suggests that future research should investigate decision support tools for such decisions.

Keywords. Reshoring, manufacturing location decision, decision criteria, case study

Introduction

Reshoring is the relocation of value adding activities from offshore countries back to the country of origin [1]. In recent times, reshoring has become increasingly interesting, which is to a large extent explained by companied reversing previous offshoring [2]. Despite the increased knowledge, there is a lack of decision support. Studies have shown that different tools are used for reshoring and offshoring decisions. For example, an old costing model for the offshoring decision, and a total landed cost model for the reshoring decision [3]. This aligns with the argument that offshoring and reshoring both are done for different reasons [4] [5]. The main reason behind offshoring has been to increase short-term cost savings by exploiting low labor costs and manufacturing costs, whereas the reasons behind reshoring has to increase quality, flexibility and proximity to customers [2] [6].

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One way to reach a decision is by having a checklist so that the managers are aware of all possible criteria that should be considered in a decision [7]. Such a checklist would avoid unpleasant surprises to managers. Another type of tool would be some form of sensitivity or what-if analysis that considers all possible scenarios in order to make a reshoring decision [8]. This tool would inform managers how different scenarios would impact the reshoring decision. Another type of tool would be to use linguistic techniques, for example a fuzzy inference engine that provides an evaluation output when different input values are entered [9]. This tool would be a quick and automatic evaluation of a reshoring decision when different input criteria are considered.

In order to realize such a decision-making tool, there is a need to explore the criteria that impact a reshoring decision [10]. Some of the criteria have been homogenously categorized such as cost-related criteria, out of which labor cost and administrative cost are most frequent [5] [11], quality-related criteria, out of which product quality and process quality are most frequent [6] [12], location-specific criteria, out of which government incentives and regulations are most frequent [13] and risk-related criteria, such as natural disasters and political conflicts are addressed [8] [14]. Another approach of categorizing all the cost related criteria is by using some hierarchy according to product costing [15]. Such a hierarchy of costs simplifies the problem of having too many criteria by establishing relationships between the criteria. The purpose of this paper is to identify the influencing criteria that are considered in a manufacturing reshoring decision.

1. Literature review

This section goes through eight important areas identified through a literature review. The literature review ends with a presentation of a framework used in this research.

1.1 Reshoring decision making frameworks

There are some existing decision-making frameworks for reshoring decisions, however these are only theoretical exercises [16] [17]. In one such conceptual framework push factors and pull factors are evaluated, and these are compared against the benefits of offshoring [16]. The final decision is either to pursue further offshoring, stay at the offshored country or reshoring. Another such conceptual framework consists of eight steps of reshoring process and these were classified into a decision-making process and a decision-implementation process [17]. When considering contingency theory perspective, another such decision-making framework integrates contingency factors, reshoring drivers and implementation factors into making a reshoring decision [18] Recently, automatic approaches to decision making have been explored through fuzzy logic [9]. In order to use such automatic approaches, there needs to be a set of criteria to evaluate.

1.2 Competitive priorities criteria

Competitive priorities can be cost-related and non-cost related priorities [18]. The cost-related criteria make this kind of decision more attractive. Some of these criteria have been instrumental in shaping the offshoring decision as well, such as labor cost or raw

material cost. However, these costs have increased over time, leading managers to make reshoring decisions [19] [20]. Most of the cost criteria can be represented in product costing hierarchy [15]. The total cost of doing business is an important cost criteria [14]. Under this type of cost, there is manufacturing costs typically addressing cost of labor, materials and factory [3] [12], distribution cost typically addressing inventory cost, transportation cost, customs cost, order fulfillment cost, stockout and late deliveries cost [21] [22], administration cost typically addressing coordination and monitoring cost [18] [23], non-compliance and legal costs [24] [25], and lastly costs that are related to the reshoring project such as switching costs [8].

The non-costs related competitive priorities are quality, time, flexibility, innovation and sustainability. Each of the competitive priorities consists of various decision criteria. Under quality-related criteria, the common ones are product quality, process quality, and brand quality have been the mostly addressed [6]. Other quality-related criteria are service quality, delivery dependability (quality), supplier dependability (quality) and management quality [17] [20]. Under time-related criteria, the common ones are delivery time and time to market [20] [26]. Under flexibility-related criteria, the common ones are concerned with product, volume and production mix flexibility [20]. Under innovation-related criteria, the common ones are concerned with product, process and technological innovation [22]. Under sustainability-related criteria, the common ones are concerned with product, process and supply chain sustainability [4].

1.3. Resource criteria

The resource criteria affecting reshoring decisions are divided into two groups: availability of resources and proximity of resources. In order to create a sustained competitive advantage at a location, resources (internal or external) need to be accessible to the firm. Some of these potential resources that affect a firm on account of their ease of access are availability of labor [23], availability of raw material [14], availability of suppliers and availability of manufacturing technology [11] [27]. Other resources that are limited by their availability are finance, foreign markets, transportation infrastructure, energy and recycling infrastructure [28] and information technology [29]. Proximity to a resource addresses the geographic closeness of the resource and is critical in creating a sustained competitive advantage [22]. This helps to create a synergy and increases responsiveness of the firm to dynamic changes. Some of the common decision criteria that affect a firm on account of their geographic closeness are proximity to the customer [22] and proximity to supplier [4]. Other decision criteria on account of their geographic closeness are proximity to R&D, headquarters, proximity to knowledge, proximity to industrial clusters and proximity to marketing [17].

1.4. Strategy criteria

Some of the reshoring criteria can also be related to strategy of the firm; as a result, there has been increasing discussion on categorizing reshoring criteria into managerial mistake and strategic decision [17]. An explicit strategy guides firms in their decision-making processes, and firms that have an explicit strategy are active in moving their production [19]. The strategies that were identified are business strategy, product strategy, operations and marketing strategy. Studies have shown that a shift in the business strategy can trigger reshoring decisions [30], change in product strategy and focus on “high-end” products can trigger reshoring to high-cost countries [5], negative experience

from previous relocation have forced firms to rethink their operations strategy [6], and a shift in marketing strategy, for example following a branding strategy can trigger reshoring decisions [31]. This is in line with the argument that reshoring is a long-term perspective of the company [16].

1.5 Global condition criteria

Global condition criteria have been critical in making reshoring decisions. Studies have shown that global economy plays a role in redistributing production and that firms have reshored as a consequence of the global economic crisis or a poor global economy [2] [17]. Another important criterion is the currency exchange rate or currency exchange variability [3]. For example, fall of euro against the US dollar have been deterministic in reshoring decisions [32]. Another criterion that must be paid attention to is the inflation rate in countries where the firm is operating [11]. High inflation rate can slow down economic growth of a region, leading to reshoring decisions [33].

1.6 Preference criteria

Studies have shown positive attitudes from consumers towards reshoring in creating value for the company [34], and in some cases, it was a customer's requirement to reshore [6]. Therefore, customer's preferences have an effect on the reshoring decision. Similarly, the owner of the firm also has preferences that shapes the strategy of the firm; for example, the owner's mindset to create a local supply network can lead to a long-term strategy to reshore [4]. Some studies have suggested that reshoring decisions are made by different people than offshoring decisions, suggesting a managerial preference for reshoring [11]. Moreover, it can be a correction of previous offshore failure by management, thinking as a correction mechanism [7]. In some cases, emotional preferences such as loyalty to home country/patriotism have also been decision criteria which lead firms to reshore [26].

1.7 Contextual criteria

Recent studies have shown that home country contexts play an important role when it comes into reshoring [31]. Also among industries, studies suggest that there is more reshoring in some industries than in other industries, suggesting that industry contexts are important [19]. Some studies have pointed that product-related criteria such as the size of the product, weight of the product and customization of the product are relevant for reshoring decision [18]. Some studies have also pointed the relevance of company specific characteristics such as governance mode and size of the company as relevant for reshoring decisions [23]. Some studies have pointed out the relevance of market specific characteristics such as market size, changing consumer patterns [25] or reshoring project characteristics such as entry-exit mode or ownership mode [21].

1.8 Theoretical framework

One of the popular theories within reshoring literature is the resource-based view (RBV), which is used to explain how firms can achieve sustained competitive advantage in home country [35]. Accordingly, firms possess resources (internal and external) that are

valuable, rare, inimitable and non-substitutable which provides competitive priorities to the firm. These competitive priorities impact the performance of the firm at a location. The competitive priorities depend on the choice of firms’ strategies. The firm’s strategies are shaped by contexts and preferences of stakeholders. The strategy is also affected by the current performance of the firm. The performance of the firm is influenced by global conditions, and these global conditions in turn impact resources of the firm. The connections between the different groups of criteria are shown in figure (Figure 1). From the reshoring literature, it can be said that firms relocate in order to redistribute their resources. These resources can be internal to the firm or external to the firm. Some of the resources can be divided based on their availability or proximity of the resource. Therefore, two classifications are possible: proximity of resources and availability of resources. Further two classifications are possible based on localization (internal or external) of these resources: resources internal to the firm and resources external to the firm.

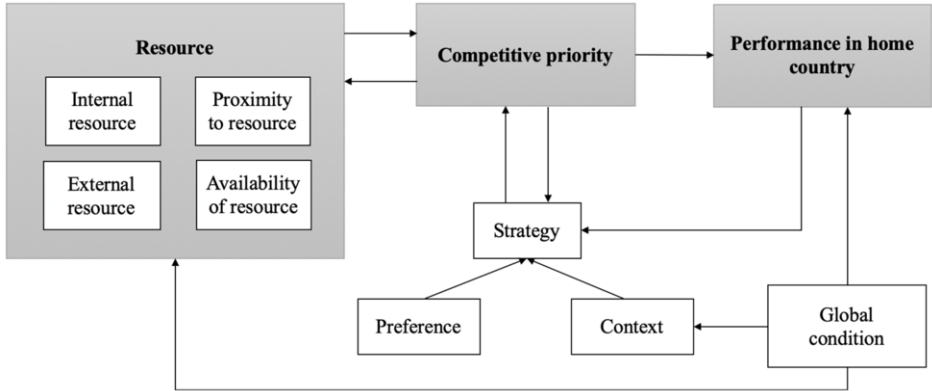


Figure 1. Theoretical framework of reshoring decision criteria

2. Research methodology

The study is a multiple-case study, including five Swedish manufacturing companies. All of the companies operate in different types of industries. The description of the companies is presented in a table (Table 1). The companies are selected through purposive sampling. A case study is preferred since reshoring is contextual [11]. The multiple case study research captures a holistic perspective and deep understanding of the reshoring phenomenon [36]. The data is collected through interviews and document studies. Only the persons involved in the decision were interviewed, and the documents involved those files that were created in the feasibility stage. The data collected was analyzed within-case and in cross-case. The disadvantage of retrospective cases is that participants may not fully recall important events [37]. Semi-structured interviews were conducted between 2016 and 2018. An interview protocol was used in order to ask specific questions and open up for discussions when needed. Some of the interviews were complemented with document studies. Firms ElecCo and OfficeCo provided documents of their pre studies before the reshoring decision. Each of the interviews were transcribed. The transcripts were analyzed to identify those criteria considered in the decision.

Table 1. Overview of companies in the case study.

Firm name	Geographic reshoring	Owner ship	No. of employees (2018)	Turnover (in MSEK, 2018)	Products	Data collection files
ElecCo	Poland to Sweden	Conglomerate	23	70	Electric equipment and power outlets	5 interviews 5 documents
PlastCo	Denmark to Sweden	Conglomerate	135	380	Plastic pails	2 interviews 1 document
SpringCo	China to Sweden	Family-owned	80	137	Industrial springs and environmental solutions	2 interviews 1 document
AlumCo	China to Sweden	Family-owned	35	65	Aluminum profiles	4 interviews 1 document
OfficeCo	Lithuania to Sweden	Conglomerate	135	693	Office equipment	5 interviews 17 documents

3. Findings

The findings are summarized in Table 2 and will be discussed below.

3.1 ElecCo

ElecCo outsourced large parts of its manufacturing to suppliers in Lithuania, Latvia, Russia and Poland. This decision to outsource was driven by the opportunity to reduce costs and to expand to different markets. The Polish supplier increased prices by up to 25%. The manager then realized that their choice of outsourced supplier was wrong, which also led to the reshoring decision. Another problem from the outsourced supplier was poor delivery quality. Furthermore, a cost analysis done by the company showed that suppliers in Sweden had lower raw material and transportation costs. Other costs that were considered were inventory costs, quality monitoring cost, customs costs, investment in tools costs, and project (for ramp-up) costs. Therefore, the company took a decision to move the production back to Sweden. The company selectively reshored some of the articles where most of them were standard components. Some of the products that were more complex were harder to reshore. The products that were reshored could be easily machined through automation. The decision process of ElecCo was based on per-unit cost of the product in both locations. During the process, the manager expressed the difficulties in quantifying the less obvious costs, such as monitoring and coordination costs. The manager said: “...it would be good to get some percent for which one can put on overhead costs, or extra quality control, or increased safety stock...”. The decision process for reshoring was based on timely delivery, proximity to customer and high delivery quality.

3.2 PlastCo

PlastCo have had an offshoring strategy in order to open to new markets outside Sweden. Their customers are mainly having their facilities outside Sweden, and the idea has always been to follow the customer. Therefore, the company moved the production to Denmark and got access to the market in Northern Europe. The facility in Denmark was small and the company were not able to produce the volume required for the market. Moreover, the company started experiencing problems with the logistics. The manager

said: “...Denmark was a clear choice, but the logistics is better here...”. Therefore, the CEO of PlastCo took upon a project to bring the production back to Sweden. During the reshoring process, PlastCo lost all the labor competence in Denmark. The manager said: “...we lost many things like the packing expertise, which they [the Denmark facility] had a good look on...”. According to the manager, the most important step was that information should be given to all the important stakeholders, otherwise the quality and delivery dependability would suffer. The manager said that: “...all the changes must have willingness from all the partners and if that is not there, then it will be stuck...”. The reshoring decision making process was done based on a complete risk analysis. The analysis included different cost factors and soft factors. The decision-making process was done by multiple people, so it required careful and multiple rounds of analysis. The manager said that: “...we discover that it [the reshoring process] works or not, only after it [the reshoring process] is done...”. The manager said that: “...there was a lot of gut feeling that convinced us that this was right. We didn't feel the need for money, if we got the signal from customers in Sweden that told us that they would purchase from us...”.

3.3 SpringCo

SpringCo produces springs for a wide range of applications. The process of producing springs was mechanized for long time now. In 1980s the company expanded to China, but shortly closed down. In 2000s, the company started parallel factories in Serbia and in China, but the competence was still lacking in these factories. With a large presence of customers in China, the company was motivated to offshore. The volume that was offshored to China was low. SpringCo witnessed that there was a pressure on wages at the offshored location. On the other hand, SpringCo observed that they were able to achieve high volumes at home factory through automation and robotization. Therefore, they decided to automate the process at home and reshore the low volume product. The product now is produced in Sweden and sent over to their subsidiaries around the world. The manager said: “...we have also become more machine-oriented and interested in production... we have built our robot cells together with the supplier ...now you can just stand there and produce, which could not have been done 10 years ago...”. The company invested on robots in order to automate the Swedish factory. Moreover, the manager suggests to do perform a holistic risk analysis before making a decision. The reshoring decision making process was economical one based on product life-cycle costs, rather than soft vales. The manager said: “...we have trained ourselves lot on this side of the job, so we are better at doing economical decisions than any other decisions...”. The manager cautioned that there could be emotional advantage of taking the production back home, however he exclaims that he hates to take an emotional decision. Another reason for this is that the customers would always evaluate them since they are curious about such decisions.

3.4 AlumCo

AlumCo is a strategic supplier to large customers. The company has a low-volume and high complexity in production. AlumCo then began exploring for options to reduce cost for their customers and therefore, they offshored some of their production to China. The manager said: “...the customer can wish for if they want in China or in Sweden, but in many cases, they have a target price, they hold it up to us and we are sometimes forced to strategically move the production...”. The company perceived a trend among its

customers to reshore and followed its customers. According to the manager, the main reason of reshoring is because of the quality and the effectiveness of production. Other reason for bringing back is the lead time since the customers requested short lead times and less inventory. Another reason is that they were able to automate the production in Sweden. The manager said: *"...we have a robot with vision, and it is very much programmed..."*. The reshoring decision making process was done internally and structured in form of a decision tree. The total landed cost was the most important criteria. The manager insists that this part should be analyzed in detail. The company calculated both cost of offshore production and home production. In offshore production, the cost of delivery was a major criterion since it includes customs. In addition to that, risk analysis and flexibility criteria were considered for each product. For each product, the weight and volume were also considered. The company avoids allocating general costs for all products. The manager said: *"...no generalization, we only allocate a percentage so we know it... 10% may not be the whole but it is dangerous to generalize, so it could be 23% for one product but 3% for the next and then you decide entirely on one product..."*.

3.5 OfficeCo

OfficeCo is one of the leaders in design, development and production of office equipment in Europe. They have a strategy to expand their market. In 2014, the company took decision to outsource manufacturing of their upholstery to Lithuania. The decision was based on a total cost of ownership (TCO) model at the company. According to the model, the company would have yearly savings. The reason for the lower total cost of outsourcing is due to the lower labor costs, and the product being labor intensive. Over time, economic conditions have changed, and there was a need to increase flexibility in production. Therefore, OfficeCo have considered reshoring of their outsourced upholstery back to their own facilities in Sweden. The reshoring decision making process was based on the TCO model. The model showed that the company is able to reduce the price of the product by bring it back home. The managers said: *"...such a calculation, whether we move in or out, it's extremely, it's very difficult to count on all the costs..."*, suggesting that accounting all the costs is a difficult task. The manager also did not want to cut down on value creation time, which was done through automation in order to make up for the high wages in Sweden. According to the quality manager, one of the reasons for reshoring is the requirement to increase flexibility in production. The manager said: *"... yes, partly flexibility, and since you may have, with the scale of outsourcing has forced to evolve. It's better to work smarter and adopt new technologies to maintain production..."*. Moreover, with reshoring, the company were able to get shorter delivery times. According to the production manager two important criteria played a role in reshoring to Sweden: the first one was the overall economy and the other was customer satisfaction. The manager said: *"...you find satisfaction benefit in terms of getting top-line growth because you can offer faster delivery, possibly more secure delivery or production, that you have the product and can affect it close to yourself..."*.

Table 2. Reshoring criteria considered by case companies.

Criteria		ElecCo	PlastCo	SpringCo	AlumCo	OfficeCo
Competitive priority criteria	Total cost	X	X	X	X	X
	Manufacturing cost				X	X
	Raw material cost	X			X	X
	Energy cost	X				
	Labor cost	X	X	X		X
	Distribution cost		X	X	X	X
	Warehousing cost		X		X	X
	Inventory holding cost	X	X	X	X	X
	Transportation cost	X	X	X	X	X
	Customs cost	X			X	
	Coordination cost				X	X
	Monitoring cost	X	X			X
	Switching cost	X	X	X	X	X
	Process efficiency				X	X
	Labor productivity			X		X
	Flow efficiency		X			X
	Product quality				X	X
	Process quality	X	X		X	
	Delivery dependability	X				X
	Supplier dependability	X	X			X
	Brand quality				X	
	Delivery lead time	X	X	X	X	X
	Delivery flexibility	X				X
	Volume flexibility		X		X	X
	Product mix flexibility				X	
	Supplier flexibility	X				
	Product flexibility				X	X
	Labor market flexibility		X			X
	Labor flexibility				X	X
	Product innovation					X
	Supply chain innovation					X
	Product sustainability				X	
	Process sustainability		X	X	X	
	Supply chain sustainability	X			X	
Resource criteria	Proximity to customers	X	X	X	X	X
	Proximity to suppliers	X	X		X	
	Proximity to R&D		X	X	X	
	Proximity to knowledge institutions		X			
	Proximity to industrial cluster				X	X
	Availability of labor		X	X	X	X
	Availability of suppliers	X	X		X	X
	Availability of raw material			X		
	Availability of manufacturing technology	X	X	X	X	X
	Availability of transportation infrastructure		X	X		
	Availability of production infrastructure		X		X	X
	Availability of energy infrastructure		X		X	
	Availability of information technology	X	X			X
	Availability of production capacity		X		X	X

Strategy	Process control	X		X	X	X
	Supply chain control	X			X	X
	Supply chain governance				X	X
	Government incentives			X		
	Evaluation process	X	X		X	
	IP and know-how			X		X
	Internal communication	X	X			
	Operations strategy	X	X			X
	Industry practice		X	X		
	Product characteristics	X	X	X	X	
	Market characteristics		X	X	X	X
	Industry characteristics			X		X
	Regional culture	X	X	X	X	
	Company culture		X	X		
	Customer preference	X	X	X	X	
	Owner preference		X	X		
Context criteria	Management preference		X			
	Emotional preference		X	X	X	X
	Economic conditions and stability	X	X		X	X
	Exchange rate		X		X	X
Preference criteria	Government policies		X	X		X
	Labor union			X		
	Trade barriers				X	
	Supply chain disruption		X	X	X	X
Global condition criteria						

4. Concluding discussion

The reshoring decision made at the case companies consisted of criteria occurring at multiple categories of the theoretical framework. In all of the companies, criteria were found at the categories: Preference, Context, Resource, Competitive priority and Global conditions. This suggests that reshoring is a holistic decision and takes a birds-eye view on the decision making. The empirical findings are consistent with the theoretical framework, that criteria were found at all categories of the framework. The theoretical framework of resource-based view was used in order to develop connections between resources, competitive priorities and the performance of the firm in home country. The reshoring criteria found in all case companies were total cost, inventory holding cost, transportation cost, switching cost, delivery lead time, proximity to customers, and availability of manufacturing technology. All the case companies did some total cost analysis, but the type of analysis used for reshoring decision making differed in each company. The different cost analysis techniques used were per-unit costing (ElecCo), decision tree (PlastCo), life cycle cost (SpringCo) total landed cost (AlumCo) and total cost of ownership (OfficeCo). In spite of having different costing analysis, common criteria for all the case companies were inventory costs and transportation cost. Additionally, all the case companies included switching costs since certain investment was required in order to move the production in-house or to shift suppliers to the home country [8]. Other reasons of reshoring were to reduce delivery lead times by locating the production geographically close to the customer [6] and automate the process in the home country to bring back labor intensive processes [29], addressed by all case companies. This study provides further empirical evidence and support previous case study that took reshoring decision as a result of holistic cost analysis [3].

Moreover, most companies in the study (4 out of 5) consider some of the soft factors involved in the decision such as customer and emotional preferences. This is in agreement with previous research that stakeholders of the firm have “soft” preferences that decide the strategy of the firm to reshore [4]. Most companies in the study (4 out of 5) have also considered context of the product and market in their decision, in agreement with previous research that reshoring decisions are contextual [18] [27]. Among the resources criteria, most companies in the study (4 out of 5) consider availability of labor and availability of suppliers. There is agreement among case companies that there is a lack of technical competence in labor force in the home country. Among the global conditions criteria, most companies considered economic conditions and supply chain disruptions, indicating the dynamics of global events affecting their supply chains [8]. Among the strategy criteria, only three firms had an explicit strategy during their reshoring decision [30]. The effect of strategies is relatively less explored in the literature and is an interesting avenue for future research. Other important future research avenues would be to develop a model of the decision criteria based on the theoretical framework of reshoring criteria and investigate suitable decision-support tools for reshoring decisions.

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