Low-Cost versus Innovation: Contrasting Outsourcing and Integration Strategies in Manufacturing

Lars Bengtsson, Robin von Haartman and Mandar Dabhilkar

This paper analyses how two different outsourcing manufacturing strategies relate to plant performance and innovation capability when taking into account the organizational integration of design and manufacturing as well as product complexity. The study discriminates between low-cost-oriented outsourcing and innovation-oriented outsourcing. The empirical data used is based on a survey of 267 engineering firms, of which half have outsourced manufacturing. We found that the two outsourcing strategies do have different effects, which illustrates that outsourcing represents a trade-off between improving innovation capability and lowering costs. The study furthermore shows that manufacturing and supplier integration in product design processes is mainly beneficial when applying innovation-oriented outsourcing, and in particular when products and manufacturing processes are complex.

Introduction

Outsourcing has become a common strategic tool in many Western manufacturing firms in recent years (Beaumont & Sohal, 2004; Kakabadse & Kakabadse, 2005). The most common motives and proclaimed benefits of outsourcing concern cost reduction, due to suppliers’ superior economy of scale and/or lower wages. An emerging rationale for outsourcing is to become more innovative through increased focus and by getting access to suppliers’ competencies (Quinn, 2000; Medina, Lavado & Cabrera, 2005; Outsourcing Institute, 2005; Fifarek, Veloso & Davidson, 2008).

Despite the strong arguments for outsourcing research, previous studies on outsourcing effects show few or contradictory results concerning the effects of outsourcing on performance (Gilley & Rasheed, 2000; Laugen et al., 2005; Espino-Rodriguez & Padron-Robaina, 2006; Bengtsson, 2008). We suggest three possible explanations for the ambiguous outcomes of outsourcing manufacturing. One is that few studies acknowledge the relation between outsourcing motives and their respective effects. As previous studies mix various motives, the reported outcome will likely differ. A second plausible explanation for the contradictory results is that outsourcing represents a trade-off situation and a dilemma. Previous studies indicate that outsourcing for cost reasons may damage the capacity for industrialization (preparing new products for volume manufacturing) and thus the innovation capability of firms (Mol, 2005; Dankbaar, 2007; Bengtsson & Berggren, 2008).

A third possible explanation is that the outcome of outsourcing is moderated by the strategy for internal and external integration, as suggested by some researchers (McIvor, 2005; Espino-Rodriguez & Padron-Robaina, 2006). The integration needs and mechanisms are furthermore affected by the complexity of products and manufacturing processes. High complexity and interdependencies between components and processes have generally been considered a barrier for effective outsourcing (e.g., Chesbrough & Teece, 2002 [1996]; Ulrich & Ellison, 2005). Despite the numerous studies describing the significance
of integrating suppliers and manufacturing in product development (Primo & Amundson, 2002; Tessarolo, 2007), there is a lack of large-scale studies that evaluate the moderating effects of internal and external integration in relation to different types of outsourcing manufacturing.

The purpose of the paper is to use a large-scale survey to analyse how different manufacturing outsourcing strategies affect performance outcomes when taking into account the integration of design and manufacturing and complexity. In this paper we will specifically separate low-cost-oriented outsourcing from innovation-oriented outsourcing. The purpose can be specified in two research questions:

- How do low-cost-oriented and innovation-oriented outsourcing manufacturing strategies relate to the effects of outsourcing?
- How does integration of product design and manufacturing as well as suppliers affect the outcome of different outsourcing manufacturing strategies?

The performance measures used in this study are limited to costs and innovation capability in terms of new functionality in products and time-to-market (TTM).

The paper aims to contribute to the outsourcing and operations management literature in several ways. First, it provides a contemporary empirical comparison, using a large-scale survey, of outsourcing motives and strategies and their different effects on cost and innovation capability in engineering firms. Second, the results further explain why previous research has obtained mixed results. By discriminating between two outsourcing strategies, the study explores outsourcing as a trade-off. This sheds more light on how to successfully manage the balance between innovation and cost imperatives in large enterprises. Third, by evaluating the combined effects of outsourcing manufacturing and integration, the study stresses that managing interfaces is a key to successful management of the outsourcing dilemma. Complementary to previous research, this study emphasizes that integrating design and suppliers with manufacturing processes is beneficial mainly when applying innovation-based outsourcing, and in particular when products and manufacturing processes are complex.

Theoretical Framework and Hypotheses

There are a number of definitions of outsourcing (see, e.g., Gilley & Rasheed, 2000; Espino-Rodriguez & Padron-Robaina, 2006). In this article we define outsourcing manufacturing as the process of transferring in-house manufacturing to an external supplier. In line with GAO (2004), we distinguish outsourcing from offshoring. Outsourcing means externalizing manufacturing activities to external suppliers. Offshoring refers to offshore sourcing from an internal or external supplier located abroad.

In the following we will present previous research related to our research questions, and formulate four hypotheses based on this.

How do Outsourcing Motives Relate to Effects?

The effects of outsourcing on firms’ performance are not completely clear. Previous outsourcing studies show contradictory results; while some claim a positive relationship between outsourcing and performance outcomes (e.g., Heshmati, 2003; Görg & Hanley, 2005), others report no significant or even negative effects (Gilley & Rasheed, 2000; Laugen et al., 2005; Espino-Rodriguez & Padron-Robaina, 2006). The long-term effects of outsourcing on firm competence and innovation capability are even less known (Smith et al., 2007).

One possible explanation for the variety of experiences is that outsourcing is a multifaceted concept; the mixed results could thus be an effect of a combination of different motives. It would indeed be unexpected if, for example, outsourcing aimed at cost reduction increased innovation capability. Even though some studies analyse different kinds of outsourcing, e.g., distinguishing between core and non-core outsourcing (Gilley & Rasheed, 2000), there are no studies to our knowledge specifically scrutinizing the relation between different outsourcing motives and their effects.

Based on motives, the outsourcing literature has focused mainly on either one of two types of outsourcing, cost-oriented outsourcing or strategic outsourcing (Kakabadse & Kakabadse 2005; Espino-Rodriguez & Padron-Robaina, 2006). The dominant strategy has been outsourcing for cost reasons, driven by the suppliers’ economy of scale (Quinn, 1999; Cachon & Harker, 2002) and lower labour costs (Choi, 2007).

The second type of outsourcing is driven by an ambition to become more innovative. Sometimes this is presented as a strategy to focus on the firm’s core competence and increase its ability to implement fast product development (Harland et al., 2005). There are two main arguments for innovation-oriented outsourcing in the literature. One is that outsourcing
Constraining Outsourcing and Integration Strategies in Manufacturing

Adler, Goldoftas and Levine (1999) presented some support for such related capabilities. In a meta-analysis White (1996) made by Skinner (1969), who suggested that factories face a trade-off between certain capabilities, such as quality, time and costs. Trade-off models have, however, claim that the empirical support for the sand cone model is weak. When analysing the trade-off between efficiency and flexibility they instead conclude that each firm’s ability to manage the trade-off varies. The key question rather becomes how to take a position above the average trade-off line. Another position is taken by Narasimhan, Swink and Kim (2005), who found that manufacturing capabilities are linked to specific performance gains and suggested that manufacturing plants follow different paths where capabilities are cumulative.

This debate is also relevant when analysing outsourcing. Starting with costs, previous studies have shown that outsourcing is a balancing act between lower manufacturing costs abroad and lower transaction costs locally (Mol, 2005). Of specific interest for our study is the trade-off between low-cost-oriented and innovation-oriented outsourcing. Studies indicate that outsourcing for cost reasons may damage the industrialization and innovation capability of the firm (Dankbaar, 2007; Bengtsson & Berggren, 2008). Outsourcing furthermore represents a learning dilemma. While outsourcing may open doors to external expertise and support inter-firm learning processes as described above (e.g., Quinn, 2000), several studies question the realized effects on innovation capability due to risks of organizational fragmentation and loss of critical internal skills, such as process expertise or the architectural knowledge needed to make sound sourcing decisions (Chesbrough & Teece, 2002 [1996]; Hoecht & Trott, 2006). There are also strong arguments in the product development literature for co-locating and integrating key activities, processes and knowledge in product and manufacturing processes, at least in complex product areas (Ulrich & Ellison, 2005). Allocca and Kessler (2006), for instance, found that new product development (NPD) projects were actually slowed down by outsourcing.

To test the trade-off when outsourcing manufacturing, we formulate the following hypotheses:

\[ \text{H1a} \quad \text{Firms that apply low-cost-oriented outsourcing will lower the product development costs of outsourced products.} \]

\[ \text{H1b} \quad \text{Firms that apply innovation-oriented outsourcing will improve innovation capability in terms of time-to-market and product functionality.} \]

Outsourcing as a Trade-Off

Expanding the previous argument, another possible explanation of the contradictory outcomes is that outsourcing represents a trade-off situation. The literature on trade-offs is vast and covers several scientific disciplines (see the overview in Ghemawat & Ricart i Costa, 1993), expressed in terms of end poles such as exploit vs. explore (March, 1991) or efficiency vs. flexibility (Adler, Goldoftas & Levine, 1999). The core message is that an organization cannot excel in all areas at the same time, while each capability is contingent on and corresponds to a specific organizational design. In the manufacturing area an early contribution was made by Skinner (1969), who suggested that factories face a trade-off between certain capabilities, such as quality, time and costs.

Trade-off models have, however, been questioned by researchers claiming that global competition forces organizations to develop multiple capabilities. They suggest that improvements in performance capabilities in areas such as quality, cost and flexibility relate to each other and follow potential sequences or patterns. An example of this is the so-called sand cone model by Ferdows and de Meyer (1990), which asserts that firms should start with quality. In a meta-analysis White (1996) presented some support for such related capabilities. Adler, Goldoftas and Levine (1999),
there is a need to co-ordinate product design and manufacturing by using several integration mechanisms (Passhuis & Boer, 1997; Smulders et al., 2002). This is also recognized by an approach presented by McIvor (2005), whose model, in contrast to many others, distinguishes between two major decisions. The first is the strategic choice of whether to outsource or not, and the second, if outsourcing has been the preferred option, is about how to manage the new supplier relationship.

Although outsourcing necessitates some degree of external integration, the effectiveness of that integration may depend on internal integration (Droge, Jayaram & Vickery, 2004; Hillebrand & Biemans, 2004; Gimenez & Ventura, 2005). Koufteros, Vonderembse and Jayaram (2005) conclude that a high degree of external integration may indeed require internal integration. Some authors maintain that both internal and external integration are important for effective NPD (Tessarolo, 2007). This implies that when analysing the effects of outsourcing, both internal and external integration need to be taken into account. In this paper we will restrict our analysis to two organizational mechanisms that describe the extent and form of supplier involvement and the integration of production personnel in the process of developing products and manufacturing processes.

The significance of early involvement of suppliers for successful product development is well recognized by numerous studies (e.g., Clark & Fujimoto, 1991; Calabrese, 2000; Ragatz, Handfield & Petersen, 2002; Petersen, Handfield & Ragatz, 2005). In an analysis of three case companies within the telecoms industry, Marshall, McIvor and Lamming (2007) also found that firms that have established collaborative relationships with their suppliers attained higher levels of success with outsourcing. The study did not, however, explicitly discriminate among various outsourcing strategies. An overview of studies on supplier involvement moreover showed mixed results (see Primo & Amundson, 2002). One explanation for this concerns the increased complexity when managing suppliers (Hartley, Zirger & Kamath, 1997) and that early involvement of suppliers is beneficial mostly when the suppliers provide certain skills (Fagerström & Jackson, 2002). Overall this indicates that firms applying an innovation outsourcing strategy would gain more from supplier involvement than firms applying cost-oriented outsourcing.

Most researchers agree that efficient NPD and industrialization processes require early involvement of the manufacturing function in the design process (Swink, 1999; Elfving, 2007), particularly when components have a high degree of interdependency (Ulrich & Ellison, 2005). Few studies have, however, analysed the outcome of outsourcing in relation to an integrated strategy depending on the internal integration, in our case the involvement of manufacturing personnel in product development processes (see, e.g., Smulders et al., 2002).

Because the effects of outsourcing depend on both internal and external integration, we can formulate the following hypotheses:

**H3a** Internal integration between manufacturing and product development has a positive moderating effect on outsourcing, resulting in shorter time-to-market and higher product functionality.

**H3b** External (supplier) integration has a positive moderating effect on outsourcing, resulting in shorter time-to-market and higher product functionality.

### Complexity of Products and Manufacturing

The need for integration is affected by a number of contingency factors. As rather few outsourcing studies have systematically determined what has been outsourced, we chose to investigate the moderating effect of complexity of the product and manufacturing. In an investigation of three contingencies, Koufteros, Vonderembse and Jayaram (2005) also found that equivocality, which stems from the ambiguity when developing complex products, has an effect on the relationship between integration and performance. For complex and rapidly changing products, integration capabilities seem to be crucial for innovation, i.e., the capability for rapid product industrialization and market introduction, and the knowledge to make proper sourcing decisions (Sturgeon, 2002). Chesbrough and Teece (2002 [1996]) argue that systemic innovation, in contrast to autonomous innovations, require integration rather than outsourcing. Based on the same reasoning, Lakomond, Berggren and van Weele (2006) claim that the need for integration is stressed specifically when dealing with complex products characterized by high interdependencies between various design process steps. This means that outsourcing complex products will likely be much more problematic than outsourcing more modular processes or products (Ulrich & Ellison, 2005).

Based on this we suggest the following:

**H4a** The impact of internal integration on outsourcing outcome is stronger when product and manufacturing complexity is high.

**H4b** The impact of external integration on outsourcing outcome is stronger when product and manufacturing complexity is high.
Conceptual Model

In order to explore the outcome of different outsourcing and integration strategies empirically while taking the product complexity into account, we can summarize the hypotheses (1–4) in a conceptual model, displayed in Figure 1. Besides the moderating effect of integration, the model also recognizes that integration has a direct effect on performance. The model is inspired by the framework proposed by Espino-Rodriguez and Padron-Robaina (2006).

Survey Methodology and Constructs

The empirical data is based on a survey sent out to a representative sample of Swedish manufacturing plants of engineering firms with more than 50 employees in the following sectors: metal goods, machinery, office equipment and computers, other electronics, telecommunications, instrumentation, and automotive (ISIC codes 28–35). The total population was 1,003 plants, from which 606 were randomly selected, in accordance with five strata. The number was later adjusted to 563 owing to factors such as the company going out of business. After sending three reminders, we obtained complete responses from 267 plants, a response rate of 47 per cent. A separate analysis of non-respondents was conducted by telephoning a random and stratified sample of non-respondents. When comparing the answers on key questions (regarding size, kind of production, whether the plant has design capability, as well as the complexity in design and production), no bias was detected. Another analysis comparing early and late responses confirmed the validity of the sample.

The survey instrument includes a total of 51 questions, resulting in 198 items. These cover many different areas but this paper is concerned only with those questions dealing with outsourcing characteristics, motives, strategy and outcome, product complexity and supplier integration, as well as internal manufacturing and integration in product development. The analysis in this paper concerns the 50 per cent of the firms that stated they had outsourced manufacturing during the past three years.

Outsourcing Strategies

The paper focuses on two types of outsourcing strategies: innovation and low-cost. These strategies reflect both the intentions and the actions taken. The constructs are based on the motives of outsourcing and the characteristics of outsourcing, which concern what is outsourced and to whom. By multiplying the two basic constructs, two strategy indicators were developed, which represent:

- low-cost outsourcing, i.e., an indicator of outsourcing manufacturing for cost reasons to low-cost regions;
- innovation outsourcing, i.e., an indicator of outsourcing manufacturing and components of high customer value and/or design processes to gain access to new knowledge by engaging suppliers with higher innovative capability.

The descriptive statistics on the constructs are presented in Table 1. Firms that do not outsource manufacturing at all, which include half of the companies in the survey, are not analysed in this paper.

In the next step, the outsourcing strategy indicators are used in a two-step cluster analysis (SPSS). The result was three groups of firms with significantly different outsourcing profiles on the two indicators (see Table 2). The first two outsourcing strategy clusters were...
called innovation-oriented and low-cost-oriented outsourcing firms. The third cluster of firms focused on other motives, and is left out of our further analysis.

Integration

Manufacturing Integration

The construct on internal integration focuses on the integration of manufacturing function in product development (PD) processes. It is based on the six items presented in Table 3. The statements here are influenced mainly by IMSS (2002) and research on the role of manufacturing in NPD processes (Swink, 1999). The goal of the construct is to capture both the content and the timing of manufacturing department involvement in PD processes.

Supplier Integration

The construct on supplier integration is based on the five items presented in Table 4. The statements are influenced mainly by IMSS (2002), but also Ragatz, Handfield and Petersen (2002) and Lamming (1996). The statements regarded the involvement of the company’s most important suppliers, since intensive supplier involvement is likely more interesting to the customer when dealing with strategic or complex products and processes (Primo & Amundson, 2002). The statements

Table 1. Descriptive Statistics of Outsourcing Strategy Indicators

<table>
<thead>
<tr>
<th>Motives (scale 1–5, N = 136)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1. Cost reduction of outsourced component</td>
<td>3.6</td>
<td>1.5</td>
</tr>
<tr>
<td>M2. Access to competence</td>
<td>2.2</td>
<td>1.3</td>
</tr>
<tr>
<td>M3. To take advantage of supplier’s higher innovation capability</td>
<td>1.8</td>
<td>1.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristics of the outsourcing process (scale 1–5, N = 135)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1. High customer value of the outsourced component</td>
<td>2.7</td>
<td>1.2</td>
</tr>
<tr>
<td>C2. Design responsibility outsourced when outsourcing mfg</td>
<td>4.3</td>
<td>1.2</td>
</tr>
<tr>
<td>C3. Outsourcing to low-cost regions</td>
<td>2.7</td>
<td>1.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outsourcing strategy indicators (scale 1–25, N = 134)</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS1. Low-cost outsourcing (M1*C3)</td>
<td>10.8</td>
<td>8.8</td>
</tr>
<tr>
<td>OS2. Innovation outsourcing ((M2 + M3)/2*(C1 + C2)/2)</td>
<td>4.6</td>
<td>3.6</td>
</tr>
</tbody>
</table>

Note: The survey question on motives (M) was posed as follows: ‘How important were the following motives for outsourcing manufacturing during the last three years?’ Each motive was measured on a five-point scale: 1 = No importance, 5 = Determining factor. The question on characteristics (C) was posed as follows: ‘How would you characterize your manufacturing outsourcing during the last three years?’ A five-point semantic scale was used for each item.

Table 2. Outsourcing Strategy Clusters

<table>
<thead>
<tr>
<th>Cluster</th>
<th>% of firms</th>
<th>Outsourcing strategy indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Low-cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>1. Innovation outsourcing firms</td>
<td>15</td>
<td>6.6</td>
</tr>
<tr>
<td>2. Low-cost outsourcing firms</td>
<td>38</td>
<td>21.2</td>
</tr>
<tr>
<td>3. Other outsourcing firms</td>
<td>47</td>
<td>3.9</td>
</tr>
<tr>
<td>Total (N = 128)</td>
<td>100</td>
<td>10.9</td>
</tr>
</tbody>
</table>
were designed to capture both mechanisms for engaging suppliers as well as to what extent their input is actually valued in the firms’ efforts to reduce costs and develop new products.

**Combined Effects**

In order to evaluate the combined effects of outsourcing strategy and the extent of supplier and manufacturing integration, we performed a straightforward multiplication of the previously defined concepts on outsourcing and integration.

**Contextual Factor: Product and Manufacturing Complexity**

The complexity construct is based on the sum of two questions: the complexity of manufacturing and the complexity of designing the main product. Both factors were measured on a five-point scale. The mean value for this construct for outsourcing firms is 7.6, with a standard deviation of 1.8. In the analysis we will specifically investigate firms with more complex products and manufacturing (in this case where the complexity sum is equal to or greater than 8).

**Performance Outcomes**

Performance outcomes are the dependent variables in our conceptual model. In this paper we will focus on one measure of cost reduction and two measures of innovation capability as described in Table 4. The cost measure is given while cost reduction is the main motive for outsourcing manufacturing. The TTM measure is especially interesting, as it reflects the discussion on whether internal and external integration speed up or slow down the product development process (e.g., Tessarolo, 2007). Improved functionality and quality are commonly used measures of innovation capability (see, e.g., Koufteros, Vonderembse & Jayaram, 2005).

Two kinds of performance analysis were carried out. In the first analysis we explored the direct outcomes of different outsourcing strategies.
strategies by comparing the clusters of firms (Table 2). The second analysis concerns correlations between the outcome variables and the indicators for outsourcing strategies and organizational integration, as well as a combination of them.

**Results**

The descriptive statistics of outsourcing strategies that were displayed in Tables 1 and 2 show, as expected, that low-cost-oriented outsourcing is more common than outsourcing for innovation reasons. Table 2 showed that firms also apply strategies other than low-cost or innovation outsourcing.

Table 6 shows that firms applying innovation-oriented outsourcing perceive significantly better improvements in TTM and functionality compared to low-cost outsourcing firms (and other firms). Low-cost outsourcing firms, on the other hand, perceive stronger cost reduction than other firms, even though they cannot be significantly separated from innovation outsourcing firms. The correlation analysis in Table 7 correspondingly shows that the low-cost outsourcing indicator correlates with the cost performance, while the innovation outsourcing indicator correlates with both TTM and improved product functionality. Hypotheses 1a and 1b are thus supported.

There is some evidence to show outsourcing is a trade-off decision. The cluster analysis (Table 6) shows that low-cost outsourcing firms experience significantly lower effects on TTM and product functionality than innovation outsourcing firms. Table 7 also displays a negative correlation between low-cost outsourcing and innovation outcomes in terms of TTM and functionality, even if the correlation is not significant. This means that hypothesis 2a is mostly supported, i.e., that low-cost-oriented outsourcing lowers the innovation capability compared to other firms. Tables 6 and 7 correspondingly show that firms that outsource for innovation have a lower cost reduction capability than low-cost-oriented firms, but the difference is not significant. This

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**Table 5. Performance Outcomes. Confirmatory Factor Analysis**

<table>
<thead>
<tr>
<th>Performance outcome indicators (7-point scale from −3 to +3) (N = 133)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost reduction</strong> (α = 0.64; Var.explained: 73.9%)</td>
</tr>
<tr>
<td>Reduced costs for the outsourced product 0.86</td>
</tr>
<tr>
<td>Increased control over costs 0.86</td>
</tr>
<tr>
<td><strong>TTM</strong> (α = 0.77; Var.explained: 68.5%)</td>
</tr>
<tr>
<td>Reduced time for developing new products 0.84</td>
</tr>
<tr>
<td>Reduced time for industrialization 0.89</td>
</tr>
<tr>
<td>Reduced costs for developing new products 0.74</td>
</tr>
<tr>
<td><strong>Functionality</strong> (α = 0.44; Var.explained: 65.5%)</td>
</tr>
<tr>
<td>New functionality in the outsourced product 0.81</td>
</tr>
<tr>
<td>Improved quality 0.81</td>
</tr>
</tbody>
</table>

Note: The survey question was posed as follows: ‘Please indicate the effect outsourcing of manufacturing has had on the stated factors’. Each motive was measured on a seven-point scale, ranging from −3 to +3.

**Table 6. Mean Value Outcomes for Different Outsourcing Clusters (Anova)**

<table>
<thead>
<tr>
<th>Outsourcing strategy clusters</th>
<th>% of firms</th>
<th>Cost</th>
<th>TTM</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Innovation-oriented outsourcing</td>
<td>15</td>
<td>−0.16</td>
<td>0.76 [2**, 3**]</td>
<td>0.59 [2**, 3**]</td>
</tr>
<tr>
<td>2. Low-cost-oriented outsourcing</td>
<td>38</td>
<td>0.43 [3*]</td>
<td>−0.11 [1**]</td>
<td>−0.20 [1**]</td>
</tr>
<tr>
<td>3. Other outsourcing</td>
<td>47</td>
<td>−0.27 [2*]</td>
<td>−0.15 [1**]</td>
<td>−0.08 [1**]</td>
</tr>
</tbody>
</table>

Note: The group numbers within brackets [ ] indicate that the mean difference between groups is significant at the 0.05 level (*) or at the 0.01 level (**) . N = 126.
Table 7. Correlation Analysis (Pearson)

<table>
<thead>
<tr>
<th>Indicators</th>
<th>All firms</th>
<th></th>
<th>Firms with complex products and manufacturing</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cost</td>
<td>TTM</td>
<td>Function</td>
<td>Cost</td>
</tr>
<tr>
<td><strong>Outsourcing strategy indicators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-cost outsourcing</td>
<td>0.413</td>
<td>-0.076</td>
<td>-0.085</td>
<td>0.394</td>
</tr>
<tr>
<td>Innovation outsourcing</td>
<td>0.016</td>
<td>0.319</td>
<td>0.405</td>
<td>-0.056</td>
</tr>
<tr>
<td><strong>Integration indicators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supplier integration</td>
<td>-0.060</td>
<td>0.159</td>
<td>0.152</td>
<td>-0.037</td>
</tr>
<tr>
<td>Manufacturing integration</td>
<td>0.162</td>
<td>0.097</td>
<td>0.065</td>
<td>0.197</td>
</tr>
<tr>
<td>Supplier * Manuf. integration (Total)</td>
<td>-0.038</td>
<td>0.183</td>
<td>0.134</td>
<td>-0.053</td>
</tr>
<tr>
<td><strong>Combined strategy indicators</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low-cost outs. * Supplier integr.</td>
<td>-0.140</td>
<td>0.043</td>
<td>0.040</td>
<td>-0.041</td>
</tr>
<tr>
<td>Innovation outs. * Supplier integr.</td>
<td>-0.077</td>
<td>0.351</td>
<td>0.268</td>
<td>-0.111</td>
</tr>
<tr>
<td>Low-cost outs. * Manuf. integr.</td>
<td>0.030</td>
<td>0.017</td>
<td>-0.058</td>
<td>0.056</td>
</tr>
<tr>
<td>Innovation outs. * Manuf. integr.</td>
<td>-0.012</td>
<td>0.270</td>
<td>0.148</td>
<td>-0.028</td>
</tr>
<tr>
<td>Low-cost outs. * Total integr.</td>
<td>0.012</td>
<td>0.004</td>
<td>0.061</td>
<td>0.026</td>
</tr>
<tr>
<td>Innovation outs. * Total integr.</td>
<td>-0.056</td>
<td>0.382</td>
<td>0.237</td>
<td>-0.088</td>
</tr>
<tr>
<td>(N =)</td>
<td>125</td>
<td>124</td>
<td>125</td>
<td>73</td>
</tr>
</tbody>
</table>

Notes: Values in bold indicate correlation is significant at the 0.01 level (two-tailed). Underlined numbers indicate that correlation is significant at the 0.05 level (two-tailed). ‘Outs.’ = ‘outsourcing’.
means that we cannot confirm hypothesis 2b based on this analysis.

The moderating effects of integration on outsourcing outcomes are displayed in Table 7. Supplier integration exhibits few direct correlations with outsourcing effects, except for TTM. The combined effects of outsourcing and integration are significant for the innovation strategy but not for low-cost outsourcing. This pattern is stronger for complex products and manufacturing. We thus find partial support for hypotheses 3a and 3b.

Finally, the results in Table 7 indicate that complex products and manufacturing processes make internal and external integration more important for the success of innovation-oriented outsourcing. This means that the study supports both hypotheses 4a and 4b.

Discussion

The first research question concerned the performance outcomes of different outsourcing strategies. Even though previous studies have shown contradictory effects of outsourcing, the distinctions between two outsourcing strategies revealed some coherent patterns. Low-cost outsourcing significantly correlated to cost reduction. Correspondingly, there is a clear correlation between innovation outsourcing and innovation outcome (in terms of functionality and TTM). This shows that different outsourcing strategies do have different effects as formulated in the first two hypotheses. This result means that the mixed outcomes presented in previous studies on outsourcing (e.g., Espino-Rodriguez & Padron-Robaina, 2006), might at least partly be explained by a mix of different outsourcing strategies. In contrast to Allocca and Kessler (2006), our findings furthermore show that innovation outsourcing may be beneficial for innovation capability. This contradiction might be explained by differences in measures used, but perhaps more importantly by the fact that we specifically identified firms pursuing an innovation outsourcing strategy.

The results provided partial support for the hypotheses that outsourcing represents a trade-off decision. We cannot fully claim that low-cost outsourcing has negative effects on TTM and functionality, but low-cost outsourcing firms do experience significantly lower effects on TTM and product functionality than innovation outsourcing firms. The result confirms the study by Dankbaar (2007) that proposed a possible trade-off between costs and innovation capability when outsourcing manufacturing. The lack of correlation between low-cost-oriented outsourcing and innovation capability thus contrasts with the suggestions made by Medina, Lavado and Cabrera (2005). One possible explanation is that firms applying a low-cost-oriented outsourcing strategy do not use the free resources created by outsourcing to cultivate their own innovation capability.

Hypothesis 2b was not supported. Firms that apply an innovation-oriented outsourcing strategy benefit from lower cost reduction capability than low-cost-oriented firms, but the difference is not significant. How can we explain the fact that innovation-oriented outsourcing seems beneficial for innovation outcomes yet performs acceptably at cost reduction as well? One interpretation is that the suggested outsourcing trade-off is only valid for some kinds of outsourcing, like cost-oriented outsourcing. This explanation is supported by studies that stress the interdependencies between manufacturing capabilities and performance (e.g., White, 1996; Narasimhan, Swink & Kim, 2005). Another possible explanation is that innovation-oriented firms could be ‘above the trade-off line’ (Adler, Goldoftas & Levine, 1999), where they perform better than average on innovation and are as good as others in cost reduction. Further research is needed to further explore these explanations.

Hypotheses 3a and 3b concerned the combined effects of outsourcing and integration. The correlation analysis shows that early supplier involvement in product development is more beneficial for firms applying an innovation outsourcing strategy than for firms applying low-cost outsourcing. This is in line with expectations, since early supplier involvement is the main rationale for the innovation outsourcing strategy. Moreover, Fagerström and Jackson (2002) claim that early supplier involvement is particularly important when products are complex. Indeed, this study shows a stronger positive effect of supplier integration for firms with more complex products and manufacturing.

With regard to the interaction effect between internal and external integration, our results confirm the previous studies of Droge, Jayaram and Vickery (2004) and Gimenez and Ventura (2005), as well as that of Hill-erbrand and Biemans (2004). The interaction of internal and external integration correlates more strongly with time-to-market than they do on their own. External integration requires internal integration, in this case between manufacturing and product development, in order to establish an efficient development process. Our findings furthermore confirm and refine the conclusions of Marshall, McIvor and Lamming (2007), as our results show that supplier collaboration is beneficial.
mainly when dealing with innovation-based outsourcing.

However, internal and external integration do not seem to be beneficial for firms applying a low-cost strategy. This is to some extent in line with the distinctions between different supplier relationships made by Tidd, Bessant and Pavitt (2005). Low-cost outsourcing mostly concerns non-core activities and the relation could be characterized as distant and market relational. The lack of correlation does, however, contrast with the suggestions proposed by Medina, Lavado and Cabrera (2005). The firms in our study applying a low-cost outsourcing strategy do not seem to use the free resources created by outsourcing to integrate internally and increase their innovation capability.

Finally, our results underline the need for integration of manufacturing and design when outsourcing more complex products (hypotheses 4a and 4b) and manufacturing processes. The findings, which are valid for firms applying innovation-oriented outsourcing, confirm previous studies on relations among product complexity, integration and performance outcomes (e.g., Koufteros, Vonderembse & Jayaram, 2005; Ulrich & Ellison, 2005; Lake- mond, Berggren & van Weele, 2006). The results are also in line with the reasoning put forward by, for instance, Chesbrough and Teece (2002 [1996]), who discuss the problem of outsourcing and distinguishing processes when conducting what they call systemic innovation. The results stress the need to manage interdependencies between key processes, such as manufacturing and design, when dealing with complex products and processes.

Conclusions

The purpose of this study was to analyse how two outsourcing manufacturing strategies, in combination with organizational integration of design and manufacturing, affect innovation capability when taking into account complexity in products and manufacturing. Several conclusions may be drawn from the study, conclusions that also provide further insight into why previous studies on the effects of outsourcing show contradictory results.

The first conclusion is that low-cost-oriented outsourcing differs from innovation-oriented outsourcing not only when it comes to motives and characteristics, but also in their distinctly different effects on costs and innovation capability. This highlights the importance of more clearly distinguishing among different kinds of outsourcing strategies when discussing outsourcing effects. A second finding is that outsourcing represents a trade-off between improving innovation capability and reducing costs. Firms that apply low-cost-oriented outsourcing may lack focus and thus mechanisms to use the remaining resources for innovation activities. Firms that apply innovation-oriented outsourcing have inferior cost performance, but seem to have established practices that position them above the average trade-off line. Further analysis of different strategies to manage the outsourcing trade-off is needed.

A third conclusion is that the outcome of outsourcing depends on how firms choose to integrate design and manufacturing. Firms that apply an innovation outsourcing strategy gain more from integration than firms applying cost-oriented outsourcing. For firms applying outsourcing for innovation reasons, close and early involvement of suppliers and the manufacturing function in the product development process is beneficial. The results thus emphasize the need for integrating both externally and internally in these situations. Firms that apply a low-cost strategy do not benefit from this kind of organizational integration.

The study stresses that organizational integration is specifically important for an innovation outsourcing strategy when dealing with complex products and manufacturing, since the degree of complexity decides the need for integrating interdependent processes such as manufacturing and design.

In sum, by evaluating the combined effects of outsourcing manufacturing and integration, the study underlines that managing interfaces is key to the successful management of the outsourcing dilemma. Contrasting two outsourcing strategies in combination with analysing the impact of organizational integration provides further explanation of the contradictory results obtained by previous research.

The practical implication of the study is that managers contemplating different sourcing decisions are aware of the trade-offs involved. Moreover, after conducting manufacturing outsourcing, supplier and manufacturing integration will help in reaping the benefits expected from outsourcing that is motivated by a desire for increased innovation capability.

References


