OUTSOURCING OF NEW PRODUCT DEVELOPMENT
- MORE THAN SUPPLIER INVOLVEMENT

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ABSTRACT
This paper reveals the results from using a case study of four Swedish medium-sized firms to understand the rationales behind outsourcing of innovation. Further the problem of integrating knowledge found during the project in the outsourcing firm is studied and opportunities for improvements revealed. Results indicate that for a SME with limited resources it may be better to give priority to closeness before world class knowledge as close and frequent contacts are crucial when outsourcing knowledge intense activities.

INTRODUCTION
Outsourcing, defined as subcontracting production, has been deployed for decades. In earlier models the product was defined by the outsourcing firm and produced according to specifications by a subcontracting firm, but during the last decade, the knowledge developed by subcontractors, has distributed a higher degree of responsibility from the outsourcing firm to the subcontracting firm. Today large corporations with core competences in a specific area (e.g. Bosch) do product development as well as production for many competing firms within the same industry. Suppliers’ ability to develop new products is considered a criterion of increasing importance when outsourcing production in the car industry [6].

Quinn [21] suggested that strategic outsourcing of innovation is a necessary action to gather enough knowledge and handle the insecurities of a rapidly changing world. According to this anecdotal article almost any stage of the innovation process can be profitably outsourced. Basic research and early stage development could be outsourced to universities or government laboratories and applied development and product innovation would preferably be outsourced to suppliers. Even later stages of the innovation process as business processes or new product launch could be outsourced to distributors or wholesalers. The key reasons for outsourcing innovation should be need for resources or special competences and spreading risk.

Most studies in the field are made in large firms mainly in the automotive industry [15, 6] or in the pharmaceutical industry [19]. However, a survey study of 2001 [22] in Swedish medium-size manufacturing firms indicates that the outsourcing of new product development (NPD) is much used also in this category of firms. As many as 2/3 of the firms outsource parts of their NPD process to suppliers, and more than 50% outsource parts of their NPD process to consultancy firms or universities. As many as 1/3 outsource parts of their NPD process to costumers. The survey also indicated that the R&D function was the main initiator for outsourcing of NPD and that the two main reasons for outsourcing NPD were need for technological competence and higher effectiveness in the production phase. It could be argued that results from large firms do not correspond with the experiences in smaller firms.

The research in outsourcing has moved from anecdotal articles with focus on cost and time saving to a focus on resource and knowledge acquisition. Lately some
critical articles have questioned if outsourcing of innovation could lead to a knowledge drain of the firm \[3,12\]. To be able to integrate new knowledge in-house competence is needed \[16\].

**TOWARDS A DEFINITION OF “OUTSOURCING OF INNOVATION”**

Outsourcing could be a mean to expand an operation or to rationalize an existing operation. For example if insufficient production capacity would stop expansion, outsourcing of production could be a way to expand. Or if production costs are lower in another organization, outsourcing of production could be a mean to rationalize an existing operation. Outsourcing could be defined as “purchase of an externally produced good or service that was previously internally produced” \[13\]. This implies that to be defined as outsourcing, an activity should have been earlier produced internally.

On the most basic level innovation means ”something new”. This aspect of newness has generated a number of different definitions in a number of different research traditions as for example technology management, marketing and sociology \[8\]. Researchers have viewed innovation both as the product or result (a new idea, method or device) introduced for the benefit of costumers and clients, and as the process (organizational tools or knowledge) that mediates between input and output. When innovation is outsourced, it refers to the product innovation (goods or service) that is on purchase. However, “outsourcing of innovation” linguistically could also be considered an example of a process innovation implemented to support the development of product innovations.

Outsourcing of innovation is one of many organizational modes to access external sources of technology or knowledge. Examining organizational modes such as acquisition, joint venture, alliance or networking there is a difficulty to discreetly and distinctly define outsourcing of innovation. Chiesa et al \[5\] categorizes some of the most common forms of collaboration and classify the different forms based on “level of integration” which is an issue separated into six variables. Outsourcing defined as when “a company externalizes technological activities and, then, simply acquires the relative output” is, according to all variables detected as the extreme form on each variable of cooperation. This includes the lowest level of integration, impact of the firm and control over activities. Categorized at the same extreme is a research contract which is defined as when “a company agrees to fund the cost of R&D at a research institute or university or small innovative firm for a definite technology”. Both definitions imply that the firms/institutes in cooperation are well separated and formally connected by contract to acquire “a definite output”. This distinction is important as many studies using the term outsourcing refer to any kind of external sourcing.

The process of innovation implicitly suggested by Quinn \[21\] (basic research, early stage research, advanced development, and new product launch) is very similar to what Booz-Allen & Hamilton \[2\] refers to as the New Product Development (NPD) process. The BAH model has developed to a key model in the field of NPD research. The similarities of the processes indicate that Quinn’s definition of innovation is very close to NPD, defined as the process of bringing an idea to acceptance and use on the market \[2\]. The anecdotal examples selected by Quinn also support this conclusion. Therefore innovation in the present study is considered as a product (goods or service) to be sold to external costumers. The only aspect of Quinn’s discussion that does not fit this model is outsourcing of business processes. Quinn does not define business
processes, but his examples indicate that business processes refer to supportive processes as accounting and software to support internal processes.

As innovation refers to newness it could be suggested that outsourcing of innovation should refer to outsourcing of activities that are a substantial bringer of newness to the product. Therefore less concern will be used to investigate less innovative parts of the innovation process.

The present discussion implies that in the present paper outsourcing of innovation is referring to outsourcing of product innovations (goods or service) for external costumers, where all or an innovative part of the innovation process is purchased externally from separate organizational units. This is a working-definition and its objective is not to be an overall valid definition of outsourcing.

THEORETICAL FRAMEWORK

The present study focuses on the relationship between practices of outsourcing of innovation in relation to performance. Performance could be considered as variables such as time, cost or product performance [12], but also in terms of knowledge creating and communication [3]. Most of the studies in the field focus on one or a few aspects of performance and are implicitly trying to present either a “pro or con” result or a recommendation for a “single best way” of organizing outsourcing of innovation. However, taking the foundation in basic theories such as transaction cost theory, resource-based theory, and knowledge-based theory arguments would suggest a contingency approach [14] to the phenomena of outsourcing innovation. The next chapter tries to distil suggestions to a contingency framework based on the theories above.

Transaction cost theory

According to transaction cost theory, the organization of economic activities in the firm depends on balancing internal economies, such as scale, against cost of transactions. According to Williamson [25] transactions are “the exchange of goods or services between economic actors, who are separate units, inside and/or outside the organization”. In this perspective organizational success would be described as managing transactions efficiently to lower transaction costs. The framework offered could be appropriate to analyze an outsourcing option as the choice between an external provider (market) could be compared to providing an in-house service (hierarchy). Outsourcing could lead to smaller costs for producing the service (i.e. no investments for utilities and personal, economies of scale that an external provider offers) but also higher transaction costs (i.e. due to negotiation, monitoring and legal disagreements). Williamson [26] argues that transaction costs increase as a result of three factors:

- Asset specificity refers to the uniqueness of the firm’s knowledge and hardware and the possibility to alternative uses of assets. Higher degree of uniqueness would lead to higher transaction costs.
- Uncertainty (i.e. unpredictable market, technological uncertainty, or contractual complexity) could lead to higher transaction costs due to need of structured control mechanisms and/or adoption to standards.
- Infrequency of outsourcing might lead to higher transaction costs due to relation building or low economy of scale in legal matters.

The transaction cost perspective raises the question whether an outsourcing decision is economically reasonable. Basically only cost should be considered, but of
cause time affects cost and also long term knowledge creation could create costs in a later stage.

**Resource-based theory**

According to resource-based theory, a firm could be considered a collection of productive resources, and the growth of the firm is depending on how slack resources are utilized [17]. A definition of resources could be rather broad. Resources are those tangible and intangible assets that the firm possesses for some period of time [4]. Thus, "firm resources include all assets, capabilities, organizational processes, firm attributes, information knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness" [1, p.101]. Barney [1] classified possible resources into three categories: physical capital resources, human capital resources and organizational capital resources. Four criteria must be attributable to the resources in order to provide sustained competitive advantage [1]:

- the resource must be valuable to the firm,
- the resource must be unique or rare among a firm’s current and potential competitors,
- the resource must be imperfectly imitable and,
- the resource cannot be substituted with another resource by competing firms.

In other words, according to the resource-based approach to strategic management, a firm’s competitive position depends on its ability to gain and defend advantageous positions concerning resources.

Resource-based approach to strategy is concerned not only with the use, but also with the development of the firm’s resources. In his five-stage procedure for a resource-based approach to strategy formulation, Grant [9] describes the necessity of upgrading and extending the firm’s resources to fill the gap between identified resources and needed resources. Grant [9] argues that in order both to fully exploit a firm’s existing resources, and to develop competitive advantage, the external acquisition of complementary resources may be needed. According to Grant filling this gap through outsourcing not only maintains the firm’s resources, but also increases resources, extends competitive advantage and broadens the firm’s set of strategic opportunities.

According to resource-based theory the outsourcing decision would be based on lack of resources to fill the strategic gap, as the difference between desired resources and actual resources. Missing resources could be investment capital to get needed assets, but also knowledge in a specific area or number of personnel.

A resource-based perspective raises the question whether a firm should build internal resources or rely on acquisition of external resources. Both decisions create a new resource configuration to be considered in a later situation.

**Resource dependence theory**

While the resource-based theory focuses on the internal resources available and needed and the gap between the two sets of resources, the resource-dependence theory focuses on the external environment and argues that all organizations, to some extent, are dependent on some elements in their external environment [18]. The dependency is caused by the external elements’ control of some resources that the firm needs, such as labor, capital or specific knowledge. Pfeffer & Salancik [18] provide three dimensions of organizational task environments: concentration, munificence and interconnectedness. Concentration refers to the dispersion of power and authority in
the environment, Munificence refers to the scarcity or availability of critical resources and interconnectedness refers to the number and pattern of linkages among organizations. Organizational effectiveness could be expressed in terms of the organizations’ success in obtaining scarce and valued resources from the environment.

The resource dependency perspective raises the question whether a firm can create access to resources of need. In the outsourcing example this could refer to specialist knowledge or personnel resources.

**Knowledge-based theory**

Developing the criteria suggested by Barney [1] it could be discussed whether an externally sourced resource creates a sustained competitive advantage. While transaction cost theory focus on economic efficiency and resource-based theory focus on resource allocation, a knowledge-based theory focus on the role of the firm in creating, storing and applying knowledge [10]. According to Grant [11] the firm “permits individuals to specialize in developing specialized expertise, while establishing mechanisms through which individuals coordinate to integrate their different knowledge bases in the transformation of inputs into outputs”.

A firm’s competitiveness depends on the diversity and strategic value of specialized knowledge, as well as the organization’s capacity to integrate the knowledge in an effective manner. To integrate knowledge between individuals it is crucial that a common understanding of the subject exists with all the participants. For example, if a subcontractor develops an electronic regulator for the costumer, it will be easier to integrate the knowledge if the firm has individuals with an understanding for the technology.

A critical distinction is between explicit knowledge, that can be articulated and therefore communicated, and tacit knowledge that is personal [20]. Explicit knowledge could be relatively easy integrated if specialized knowledge can be translated into common knowledge [10], however tacit knowledge needs to be devised or exchanged at an experience base which permits individuals to deploy the knowledge in a new situation. Tacit knowledge is more easily integrated when internalized, as it requires close proximity.

The knowledge perspective raises the question whether knowledge and experiences gained by the partner are integrated in the firm. The knowledge developed during the activity will mainly be with the partner and maybe the firm does not need the knowledge, but in the case it does; how is the knowledge transferred and integrated in the firm?

**RESEARCH QUESTIONS**

The theoretical framework implies that the outsourcing process could be studied as an economic transaction or a search for resources or knowledge. However, any reason will create new knowledge as innovation per definition creates newness. This new knowledge will mainly be created outside the firm. Does the outsourcing firm find this as a problem and how do firms handle the knowledge distribution and integration back to the firm?

**CASE METHOD**

Case study research is especially appropriate for exploratory research, as in the present study with focus on: a) documenting a phenomenon within its organizational context, b) exploring the boundaries of a phenomenon, and c) integrating information from multiple sources [7]. As the main purpose was to find answers to “how”
questions the design was essentially an explorative case study. This would be difficult to address by testing relationships between dependent and independent variables. There were four criteria for selecting the firms for the study. First, the firm should be a manufacturing firm with its own range of products. It is probable that a subcontractor would have a different focus when outsourcing innovative activities as the customer would probably have a large impact on choice of partner and technology. Second, the firm should be medium-sized (here defined as between 200-1000 employees). Third, the firms should be in different industries to get tentative findings for dependency on contingencies. Fourth, the firms should have an in-house product development department. This is of course important as focus for the study is technology integration between in-house and outsourced development activities.

The firms selected for the study are all placed in Sweden and found in the associate network of CPDR (Centre for Product Development Research). As fairly close contacts, the firms were open to share information, easy to get to an informal interview situation and generous with access to facilities. This is an important factor when doing case study research as the depth of the study has its roots in openness and access. The firms are blinded in the presentation, but shortly described in table 1 below.

<table>
<thead>
<tr>
<th>Firm</th>
<th>No of employees</th>
<th>Turn over 2002 (Euro)</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>450</td>
<td>65,000,000</td>
<td>Mechanical office articles</td>
</tr>
<tr>
<td>B</td>
<td>304</td>
<td>150,000,000</td>
<td>Construction material</td>
</tr>
<tr>
<td>C</td>
<td>566</td>
<td>85,000,000</td>
<td>Industry cloth</td>
</tr>
<tr>
<td>D</td>
<td>328</td>
<td>55,000,000</td>
<td>Medical equipment</td>
</tr>
</tbody>
</table>

Table 1. Short description of firms in the study

General data was collected during several years of contact with the firms, visiting office and production, making unstructured interviews with all functions on the firm. Together with written materials as for example quality manuals and visions document this has built a major understanding for how the firms work. Specific data regarding the outsourcing of innovation was collected with structured interview with CEO and R&D managers at the firms. Interviews were recorded and notes were taken.

The interview data was analyzed as quantitative data (use of, how much, how many) and qualitative data (how do you control, does it work). The quantitative data was confirmed by respondent and triangulated with the other respondents. The qualitative data was confirmed by respondents and compared with written material when possible.

The analysis compared to the previous understanding of the firms helped to clarify the research questions and to develop the ideas presented in this paper.

FINDINGS

The cases have produced a number of interesting findings. There could be found a large variety in solutions and it is not possible to distinguish whether this is due to the type of industry, market situation or other contingencies. In this chapter will be
discussed reasons for outsourcing innovation, location of knowledge creation and methods for managing knowledge integration.

**Reasons for outsourcing innovation**

The material suggests that the main reason for outsourcing innovation is need for specialist knowledge. Mainly basic research and early development is the issue of outsourcing and small knowledge-based firms are the partners. The firms in the cases are well equipped with resources for conducting the innovation that is decided within the firm, but lacks special knowledge. For example one firm with high level of knowledge in the field of mechanics has a need for complementary knowledge in electronics. As only 20% of the products have an electronic part, a strategic decision has been made not to incorporate this knowledge in the firm. The outsourcing partner in this case is a small firm started in the neighborhood by a former employee who in turn has the firm as his major customer. This type of consultancy firms were the most represented partner in the material.

Surprisingly only a few examples of supplier involvement were found. The examples where suppliers were involved did not concern the product performance, but rather the manufacturability of the product. This tendency is not so distinctly found in the most studies. Maybe it could be explained by the fact that a majority of the suppliers to the four firms are low technology supplier, delivering components assembled by the firms. When suppliers were involved it was often in later stages of the innovation process when the product design was already decided. The supplier involvement identified in the material did not include any activities that could be really referred to as outsourcing of innovation. They did not contribute with essential parts of the newness, neither had a contract relation with a specific output. The supplier involvement was rather based on informal contact in connection with the production ramp-up.

Results indicate that low innovation activities could be explained with a transaction cost perspective, as knowledge is not a crucial part of that decision. In one firm all types of laboratory testing is outsourced to a near SME. In this case the partner normally runs standard tests for the food industry, but have special equipment needed for the tests. This example could be fully explained with the transaction cost perspective as the decision is entirely based on economy of scale with the partner. However, often knowledge is essential to innovation and another perspective has to be taken explain the decisions.

**Location of knowledge creation**

As the main reason for outsourcing innovation appears to be search for specialist knowledge it is an important issue if this knowledge is stored in the firm. For this reason the firms were asked if the knowledge is stored in the firm and, if not, if they consider it a problem.

The analysis indicates that the core knowledge of an outsourced activity does not get back to the firm. Only applied knowledge of how to use the results is stored in the firm. This was typically found when later stages in the innovation process were outsourced. For example the knowledge of electronics and the knowledge of how to run projects in electronics development is not integrated to the firm. However, the firms do not consider this as a problem. They are focused on the remaining of the innovation process and makes use of the explicit result from the partner. As an argument the closeness to the partner is forwarded. When the relation and the geographical distance is close they can get very quick and valuable help if any
problems appear later in the innovation process. In two of the cases this normally did not bring any additional costs as the firms had constantly running projects with the partner.

One firm in the construction material industry had their main part of outsourcing innovation in the early phases. In this case it was basic research in the chemical sector that was outsourced to several small high technology firms. They had a focus on integrating the knowledge back into the firm motivated by the use of the knowledge in later stages of the innovation process. They confirmed it as a identified problem and had it as an issue at management meetings.

**Methods for managing knowledge integration**

The main finding is that when knowledge shall be successfully integrated in the firm it is important to have in-house basic knowledge or, preferably, parallel activities in the same field as the activity outsourced. This is the case in the construction material firm even though it still has to be improved. By keeping a small group of in-house knowledge people working on the project there is an interactivity that appears to be missing in the other firms. The in-house people have contact with the partner almost on daily bases and regular meeting are planned and performed. This causes a stimulating environment where new ideas can come up and be tested instantly.

It appears as even though new communication technology has been a helpful tool for performing outsourcing of innovation, the concurrency of the innovation process is strongly supported by close contacts and physical meetings. The personnel at R&D especially pointed at the informal meetings with partners as critical for keeping time and, especially, performance.

This is closely connected to the matter of specifications in the outsourcing contract. Even though all firms had an understanding for the legal importance of defining the activity to be outsourced, all appeared to use open-ended contract. It was found hard to specify the task especially in the cases where early phases of the innovation process were outsourced. Normally this affected the costs negatively and sometimes the lead-time. However the firms appeared to have a quit understanding attitude to the problem and argued that the time and cost loss normally created new knowledge that increased performance and knowledge-base for future projects.

This was however not the case when later stages in the innovation process, as advanced development, was outsourced. Here specifications were very clear and delays had to be compensated with night work at the partner’s behalf. Still it was considered a problem to give detailed specifications and the closeness to the firm was identified as an important factor for getting the project right.

**Administrative aspects**

This implies that there is not only a need for knowledge integration but also for new knowledge in the management of outsourcing innovation. The management of outsourcing innovation appears to be very different from outsourcing production. Many respondents meant that they could not use the administrative routines that they used when outsourcing production. None of the firm, however, had tried to develop or purchase a computer-based tool for administrating outsourcing of innovation. A combined solution was used by one firm, with traditional order and with a project management platform as a complementary tool. It was a great help creating a joint platform for shared documents. This made it possible to store latest version and to have joint access to protocols of new agreements. However phone and physical meetings were always preferred to chat boards and e-mail.
Integrating knowledge

It is indicated that the main part of the integration is during the realization of the activity. Close contact between operating personnel from the firm and the partner was argued to be the best way of integrating knowledge. This is maybe an obvious remark, but it could have been argued that meeting regarding technology and experiences would have been conducted after the realization. However no firm had formal information meetings for discussing experiences of the cooperation.

The knowledge integrated could be mainly classified as explicit as it consists of project documentation and physical products from the project. During the interviews we discussed two forms of tacit knowledge; technological knowledge that was not applied in the project and management experiences gained during the project. The technological knowledge was considered as partly integrated due to the close contacts between engaged individuals, but project experiences was not considered. Two of the firms found it very interesting and could identify the advantages of considering such routines in a future effort.

CONCLUSIONS

Findings from the present study indicate that the main reason for outsourcing innovation in SMEs is search for specialist knowledge. Decisions made based on lower costs or cope with peak workload was not presented. Partners in the present study were consultancy firms and small technology intense firms. Suppliers were not involved in the innovation process as an outsourcing partner but rather as informal contact in production matters in late phases. These findings contrast to findings from studies of larger firms [6] where results indicate that suppliers are a main source of external knowledge. The cases in the present study were medium-sized firms with their own product line (not sub contractors) and their suppliers were mainly smaller low-tech firms with focus on production. To find specialist knowledge in technology they had to search outside the suppliers. However it could be argued that an earlier supplier involvement would help manufacturability as has been argued for larger firms [24]. Earlier findings indicate that outsourcing of innovation to consultancy firms has rather lead to poorer manufacturability [23].

Knowledge integration is often poor when outsourcing innovation. This is especially when later phases in the innovation process is outsourced. However the firms in the study do not consider this as a problem as their knowledge source is closely connected to the firm. When early phases, as basic research or early development, is outsourced closer contact between involved individuals help the knowledge integration.

Explicit knowledge is integrated through hand-over of the innovation activity with documentation and the physical product, however no firm in the study really reflected over the problems with integrating tacit knowledge. This could be technological knowledge developed but not used in the product or experiences made during the project. The closer contact between individuals when early phases were outsourced helped the integration of new technological knowledge, but experiences made during the project were not integrated. Basically it appears that there is a lack of knowledge about management of outsourcing innovation. Methods used for control when outsourcing production does not work well when a knowledge intense activity as innovation is outsourced. Internet-based platforms for time planning and exchange/update of documents involved in the activity could help, but still frequent and short individual contacts seems to be the best way of controlling the process.
**IMPROVEMENT OPPORTUNITIES**

The firms in the study identified their main problem as how to control and follow the activity and to integrate experiences made during the activity that is the object for outsourcing. The suggestions made below are the result of the discussions with the respondents and of the analysis of the material.

A) Frequent contacts and physical meeting appears to be crucial when knowledge intense activities are object for outsourcing. Information and communication systems can help, but not displace direct communication. Tacit knowledge can only be integrated when taking direct part in the process. Therefore it might be better if SMEs search their partners in the neighborhood as cheaper meeting might be more important than having the best in the world partner.

B) Routines for following up the activity can be recommended. By conducting a formal meeting with a facilitator that initiating discussions of how the process has worked and have the process could be improved to the next occasion. This meeting will be even more effective if a larger part of the real operating participants make the evaluation and not a group of managers. During this meeting technology knowledge developed during the activity will also be integrated in an informal way.

C) An awareness of the difficulty of writing a specification of the activity would imply that a partly open end of the activity is permitted. This could be very important when running an outsourcing process in a context where many factors are unknown as in an innovation process. This is another reason for close geographical distance and frequent contacts as a quantity of small decisions have to be made in contrast to few large decisions when outsourcing production.

**FINAL REMARK**

This study will continue following the firms during a longer period of time. The suggestions presented above will be implemented in some of the firms and the possibly improved process will be followed and studied.

**REFERENCES**


