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# **Purchasing decisions: enablers and barriers to innovation in construction**

Louise Bildsten<sup>1</sup>

## **Abstract**

Innovative construction needs collective capabilities from a variety of firms. The purchasing of new products, i.e. innovations, is complex and involves many people with different interests and motivations. The purpose of this study is to investigate the purchasing decision-making process and its enablers, and barriers to innovation through three construction projects in southern Sweden. Interviews were conducted in three different projects with three different company consortia of architect, contractor and client. The interviews concerned the selection of suppliers, products and services.

The long or short-term nature of the supply chain agreements can act both as enabler and as barrier to innovation. The present study will show that the contractor-supplier relationships in the cases studied were long-term in nature, contrasting previous research findings suggesting the opposite. Furthermore, the study revealed that close relationships between contractors and their preferred suppliers, with customized products and processes, was 'business as usual' in the studied projects. It was also found that consortia select their preferred suppliers at global or local scale based on their internal strategic goals and culture.

The construction industry is constantly evolving. Long-term relationships are paramount to this evolution, due to the fact that co-creation processes require time and effort to develop. Benefits to both parties in long-term strategic partnerships can be achieved through cross-company knowledge management, win-win relationships and product co-creation. Nevertheless, this also creates barriers to innovation due to the aversion to novel solutions designed and specified by architect or a new product coming to market from new suppliers. Contractors tend to disregard innovative suggestions presented by the architects regarding new solutions, suppliers and products. Consequently, the development of new products is often hindered by preferred suppliers with less innovative solutions.

**Keywords: purchasing, innovation, supply chain, construction**

## **1. Introduction**

Construction requires a wide range of capabilities that rarely can be found within one single enterprise, but require links to technological capabilities of other firms (Gann and Salter,

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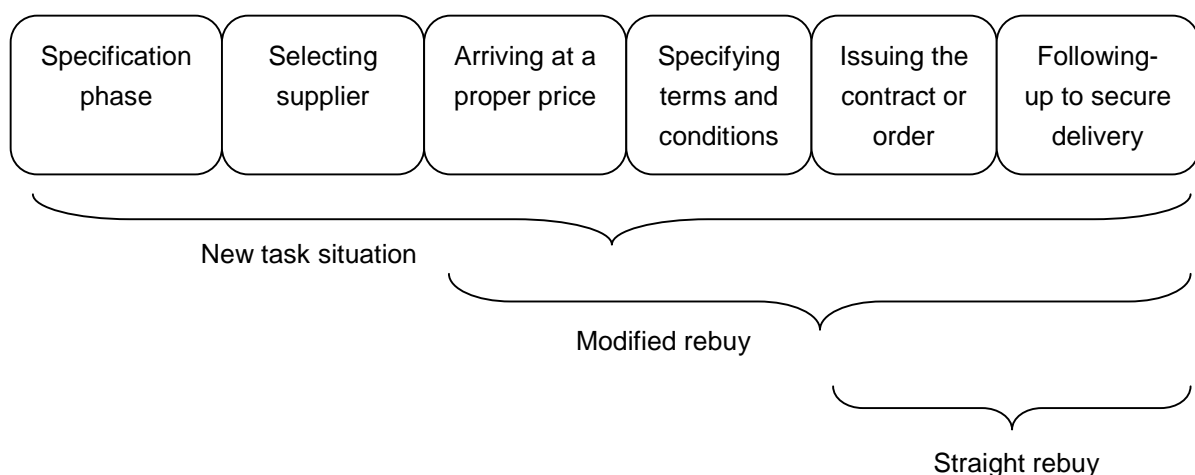
2000). Innovation from suppliers is of strategic importance to remain competitive on the market (Teece et al. 1997). Purchasing decisions have a boundary role in capturing innovation from suppliers (see for example, Van Echtelt et al. 2008; Wagner and Hoegl 2006; Wynstra et al. 2001). Throughout the purchasing process from the specification phase to issuing the contract or order, some parties exert more influence than others (Kohli, 1989). The influences are driven by different interests and motivations (Sheth, 1973), which consequently involve considerable complexity (Anderson et al., 1987). The organization of purchasing can therefore be considered having a large impact on the innovativeness of construction projects and the competitive advantage of contractor firms. The purpose of this study is to investigate the purchasing strategies, enablers and barriers to innovation through three construction projects in southern Sweden. Interviews were conducted on projects with three different company consortia of architect, contractor and client. The interviews concerned the selection of suppliers, products and services.

## **2. Buyer-supplier relationships and the purchasing process**

Construction is a project-based business (Winch, 2006), where linkages with other firms differ from traditional manufacturing regarding the interaction between buyer and supplier. Manufacturing has a more transaction-based approach to buy-sell relationships whereas construction implies much more interaction in planning, design engineering, supply and integration, erection and installation of materials, components and technical systems (Gann & Salter, 2000). In a project-based business, people typically work in temporary allocated teams with many other firms and have limited contact with senior management. In these companies, construction materials have typically been ordered by the local project leader from temporary suppliers and sub-contractors (Dubois & Gadde, 2000), which can be seen as decentralized purchasing. According to several authors, e.g. Vrijhoef & Koskela (2000), Cox & Ireland (2002), Cooper et al (2003), Love et al. (2004) and Briscoe et al. (2004), the supply of materials in construction companies is inefficient, mostly due to coordination issues that are argued to depend on the uniqueness of the projects and a fragmented supply chain.

The purchasing process includes a specification phase, selecting the supplier, arriving at an appropriate price, specifying terms and conditions, issuing the contract or order and following up with secure delivery (Van Weele, 2008). When new products are bought, the purchasing process can last several months (Emiliani, 2000). However, in practice most buys are straight rebuys. According to Robinson et al. (1967), there are three types of purchasing situations: (1) new-task situation (2) modified rebuy or (3) straight rebuy. The new-task situation is when a company decides to purchase a totally new product from an unknown supplier. The modified rebuy occurs when the company wants to buy a new product from a known supplier. The straight rebuy, also referred to as routine buy, is when a known product is bought from a known supplier. In general, the straight rebuy is the most commonly practiced approach. The first stage of the purchasing process is the *specification phase* in which two types of specification need to be addressed: functional and technical. Functional specifications describe what the product should be capable of performing. Technical specifications describe the technical properties and characteristics of the product. The functional and technical specifications constitute parts of a set of documents referred to as the purchase order specification. The purchase order specification includes quality

certificates, technical norms and standards, logistics specifications including quantity, time and place of delivery, maintenance services, legal and environmental requirements, and a target budget. The *selection of supplier* is intimately intertwined with the specification phase and constitutes the next step in the purchasing process. In this stage, the borders of subcontracting are determined, the basis of the contract is chosen (i.e. fixed price or cost-reimbursement) and a proposal including references covering previous engagements is requested from a selection of suppliers. Thereafter, the final candidate or candidates (multiple sourcing) are chosen. *Arriving at a proper price* can be conducted through competitive bidding or negotiation. From the buyer's perspective, a fixed price contract is normally preferred from a cost control and budget perspective. Moreover, the supplier is expected to take all the risks. *Specifying terms and conditions* are important and the buyers should ideally specify the company's terms of business. In contracts concerning quality and performance, penalties and warranties are commonly written-in. After the contract has been agreed, the *issuing of the contract or order* takes place. In some cases the contract is the purchase order. When routine buying is applied, call-off agreements are negotiated to cover the supply for one or more years; in this case, contracting and ordering are separate activities. *Following-up to secure delivery* is about documenting experiences with individual suppliers. Documented experiences can be useful for choosing only the best suppliers in future buys. The documentation includes the supplier's quality and delivery record, competitiveness and innovativeness. The purchasing process with its different tasks is illustrated in Figure 1.



**Figure 1: The purchasing process and different situations (abstracted from Van Weele, 2008)**

Organizational purchasing processes are complex and involve a group of individuals referred to as the 'decision-making unit' (Robinson et al. 1967) or the 'buying centre' (Webster and Wind, 1972). Webster and Wind (1972) define the buying centre as 'all those individuals and groups who participate in the purchasing decision-making process, who share some common goals and the risk arising from the decision'. The roles in the decision-making process are defined by Webster and Wind (1972) as users, influencers, buyers, decision-makers and gatekeepers.

### 3. Methodology and case studies

In order to describe and analyse purchasing strategies, enablers and barriers to innovation in construction projects, a case study approach was chosen (Yin, 2008). A case study helps in understanding contextual factors within the specific industry (Johnston et al. 1999) and is considered to provide creative insights, develop new theories and have high validity among practitioners (Voss et al. 2002). Three project organizations were studied, involving the architect, contractor and client. The project organizations were chosen due to geographical proximity and being medium-sized project. The limited size made it possible to follow decision-making of purchases. The data collection consisted of personal interviews with the actors involved and including visits to the architects' offices and the construction sites.

#### 3.1 Case study I – refurbishment of university school building

A university school building was refurbished by remodelling the inside layout for more open spaces, installation of a new ventilation system and new windows. When choosing products for this project, the *architect* used product catalogues to a large extent, mainly digital. There were also printed catalogues available at the architect's office but they are more seldom used. Products could also be selected through advertisements in magazines, although most products are chosen through directed searches. Catalogues can be inspiring in the initial phase, but not so much thereafter. Most information was accessed through searches on the internet. There are search functions for products on the internet but the architect would like them to be improved. Technical information is wanted by architects to get a quick overview of a product. Information about price and how to build is not obtained from catalogues. When it comes to that information, the architect makes personal contact with the suppliers. As the clients want several choices of suppliers (concurrence is considered important by the client), alternative suppliers are suggested by the architect. The architect has little knowledge about technical matters and trusts information given by suppliers; there is no formal agreement with suppliers, but the relationships with them are long-term.

The *client* also uses catalogues to learn about properties of products that are specified by architects. The client gains access to catalogues via the internet or directly from suppliers through meetings or presentations. There are many products in a project. If a product has not been used before, pictures and information about the product are desirable desired with tolerances and material attributes. The choice of suppliers is based on their financial strength and what guarantees they are willing to give. The client emphasizes the importance of guarantees. There are several suppliers for the same products as the client thinks it is important for maintaining competition.

The *contractor* believes that there will be more digital catalogues in the future. However, many still want paper versions as it is difficult to bring computer equipment to the outdoor environment of a construction site. The head office is responsible for the catalogues and distributes them to the different divisions within the organization. Drawings are usually digital and then printed for use on site. The contractor says that a lot of new suppliers are used because every project is unique and price is important and so involves as many actors as possible. A lot of sourcing is from Denmark (50%), but there are also suppliers in, for

example, France and China. The contractor sees no problem in using foreign suppliers; however, different standards can sometimes be a hindrance.

### **3.2 Case study II – refurbishment of student dormitory**

The refurbishment of a student dormitory concerned new kitchens and windows. In this study, a kitchen *designer* was interviewed as well as the contractor and the client. The designer also acts as a principal contractor concerning kitchen installations. The *designer* uses product catalogues to a large extent. Catalogues are, according to the designer, available increasingly on the internet. Even so, suppliers continue to send mostly printed catalogues. There is always a continual search for products. The designer is mainly interested in technical specifications of products. When proposing kitchen solutions to the client, however, the designer says that it is important to show a catalogue with illustrations. Relationships with suppliers are of a long-term nature both in regard to subcontractors and material suppliers. The company has multiple relationships with different suppliers for the same products. Yet, they hardly ever add a new supplier to their supplier base. The materials are all customer-adapted. Products are designed for fabrication in low-cost countries. Foreign suppliers account for 25-30% of total purchases.

The *client* uses product catalogues for inspiration in the initial phase of the project. The catalogues come in printed form from long-term suppliers. Printed catalogues are the preferred basis for obtaining information about products. The client does not search actively for new products. Only 5% of purchases come from new suppliers. Illustrations and technical data are the most important information in product catalogues as far as the client is concerned.

The *contractor* often uses catalogues to find information about products. Catalogues come from visiting sales personnel and the internet. Illustrations and technical information are desired in product catalogues. Paper format is preferred so that information can be easily shared at the construction site. Relationships with suppliers for both products and services are long-term. The contractor has 1-2 years price agreements with suppliers of products and the site manager has to select products from these suppliers.

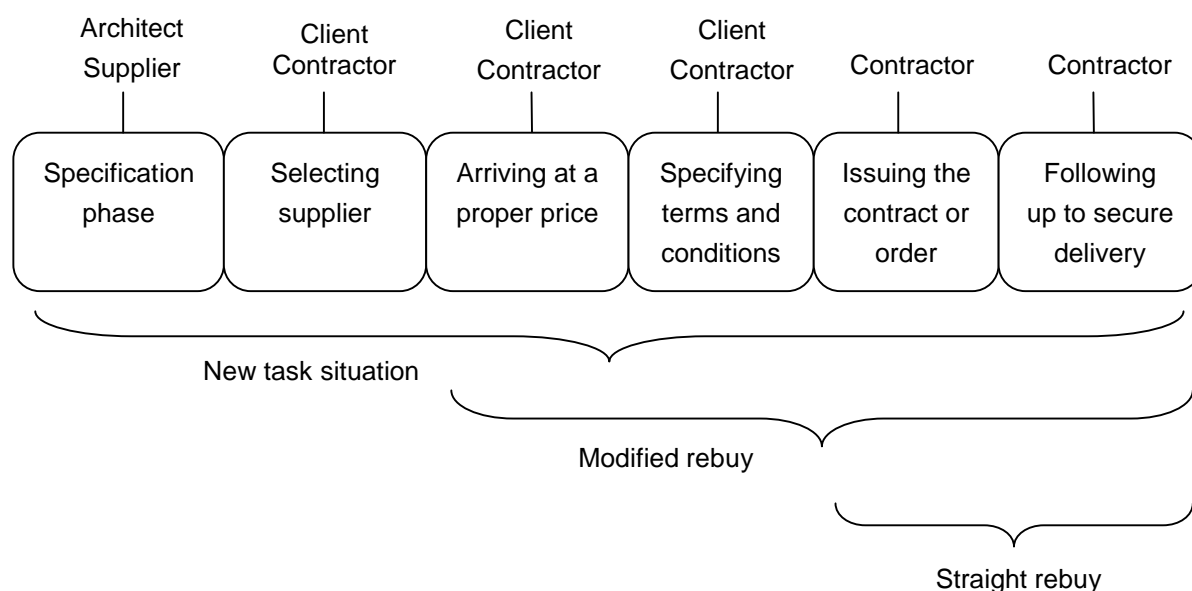
### **3.3 Case study III – construction of a new office building**

This case study concerned the construction of a new offices consisted of the production of two buildings. One of the buildings is 19 stories high and the other is 14 stories, with a combined total floor area of 9,000 m<sup>2</sup>. In this project only the architect was interviewed. The *architect* often uses product catalogues that are in both digital and paper form. Inspiration for new products does not come from the catalogues but from materials used in other projects. Catalogues are more often used when a material has been chosen: the supplier is then contacted. Technical information, as well as the possibility to combine materials, is desired from the product catalogue. The architect mostly suggests products from suppliers with whom he or she has an established relationship. Suggestions from suppliers, which have not been used before, account for 15-20% of total purchases. Relationships with established suppliers have been ongoing for 30-40 years. These long-term relationships are motivated

by concern for cost in the event that something goes wrong when trying new products and suppliers. Danish products comprise 30-40% of specified products. Windows, fittings and armatures are especially desired. Usually the contractor substitutes a cheaper product or one that offers greater discounts. Often these products are inferior.

## 4. Analysis

To analyze the purchasing decision-making process and its enablers, as well as barriers to innovation, the purchasing process of Van Weele (2008) is used as a model of inquiry (see Figure 1). The various actors interviewed are placed in the model (see Figure 2) and their effect on the final choice of product throughout the process is now discussed. The uniqueness of each product in construction leads more or less to a 'new task situation' for every project. This is because the architect has to specify the products in the design of a new building or the refurbishment of one existing. However, the process is somewhat facilitated by established relationships with suppliers participating in the specification phase. The suppliers contribute their technical knowledge so that the architect and suppliers 'cocreate' building solutions. In the next step (see Figure 2) of selecting supplier, the architect has his/her supplier relationships whereas the contractor has his/her own. The clients want products that are bought at the lowest price through competition between suppliers. Consequently, the contractor often changes products originally specified by the architect. Arriving at a proper price is achieved through long-term price agreements with suppliers of multiple products. It is the contractor that has these price agreements, so 'arriving at a proper price' is the contractor's task. The client stressed that it was important to have guarantees for products and work, which constitutes the next step of specifying terms and conditions. The client and contractor therefore discuss this matter together. The issuing of a contract or order and following-up to secure delivery is undertaken by the contractor.



**Figure 2: Actors in the purchasing process of construction**

The architect can be seen as a driver of innovation and who is continuously in the pursuit of new materials for innovative designs. In the architect's eyes, purchasing is always a new task situation that involves collection of information about design, the context in which

certain materials are used and technical specifications. A new task situation implies new products and new suppliers, which is made for a certain percentage of specified materials. One of the contractors noted that it was unusual that they asked a supplier to develop entirely new products. Most products are a modification of a standard product. When it comes to modified rebuys, a new product is bought from a known supplier. If modified standard products can be viewed as new products, these purchases can be seen as modified rebuys. Some products are, however, true bulk materials and these are delivered by ordering through middlemen for drawn off just-in-time from suppliers with which the contractor has price agreements. These products can be categorized as straight rebuys.

Products used in a project vary between new task situations, modified rebuys and straight rebuys depending on the product. To simplify the purchasing process, straight rebuys offer the most straight-forward approach. However, this hampers innovation as the voice of the architect is not considered. A relating issue is that of the uncertainty of products being allowed under building regulations and whether or not it deters the actors in general from making innovative design solutions. This inhibits purchases from new suppliers, who are unfamiliar. If a new supplier is to be considered, the product from that supplier must be shown in the context of a successful, finished project. Related to new buys is the tendency of sourcing from other countries, which is different between the projects. In the refurbishment of the university school building and the construction of the new offices, a large percentage of materials came from suppliers in other countries. In the case study of the refurbishment of the student dormitory, everything was locally sourced by the contractor; but that was not the case for the kitchen designer (who was also a contractor). A contractor that does not source from overseas is motivated by the uncertainty surrounding products which may or may not be allowed under building regulations. In addition, price agreements with certain suppliers must strictly be followed and no other suppliers are allowed.

## **5. Discussion**

The finding that contractors and architects have such long-term relationships with suppliers contrasts with the findings of Dubois and Gadde (2000) who claimed that the relationships were short-term. There seems to be an overall tendency in the projects that long-term relationships are a matter of business as usual. Moreover, it seems difficult for new suppliers to enter the supplier base. A barrier to entry is to market materials in pilot projects where it may then be difficult to find financing since contractors are reluctant to try new products i.e. to innovate. To solve the complexity of purchasing for buildings, contractors use substitute materials to those materials originally specified by architects. The question here is do these products have the same attributes in quality and design as those originally specified? These consequences would be interesting to study further. The architects seem to do a lot of research in vain in their search for innovative solutions which end-up not being implemented in the building. The architect is not a participant in the subsequent steps of the purchasing or construction process which hinders learning about how the materials are used in reality – the wish to see materials in their context was desired by architects. In the interview with architects, there seemed to be a desire to learn more about materials as most knowledge was transferred to them from material suppliers. The main barrier to innovation is the contractor taking over the choice of product when it comes to the final decision rather than



ordering the product that was suggested by the architect. To overcome such barriers to innovation, the architect needs to participate more in the subsequent stages to learn about materials in their context. This could possibly give the architects more knowledge and power to affect the final decision stages. In a closer relationship between the architect and contractor, the architect could suggest possible new solutions and the contractor could determine whether or not it is buildable. Close collaboration between contractor and architect could then be fruitful from an innovation perspective. Furthermore, the client must be informed about the differences that occur from substituting different products to those specified originally by the architect. The client should therefore also keep more contact with the architect in the subsequent stages of the purchasing process.

## **6. Conclusions**

The purpose of this study was to investigate the purchasing process and its enablers, as well as barriers to innovation. The purchasing process starts with the architect who designs the building and does research into materials which is taken over by the contractor later in the process. Both the architect and contractor have long-term relationships with suppliers. The price agreements that the contractor keeps with long-term supplier relationships is a matter of business as usual in the studied projects. This makes the purchasing process efficient as buyer and supplier do not have to go through all the steps in the purchasing process for each purchase. With common ways of working, the purchasing process becomes more routine-based and supplies are more secure. Clients seem, however, to be more interested in purchasing through competitive bidding between suppliers because they feel better deals are possible.

It can be concluded that architects together with material suppliers are enablers of innovation. The architect can be motivated by the goal of creating something new and suppliers of materials can find business opportunities. Other enablers of innovations are influences from suppliers based in other countries. These established suppliers can offer innovative solutions which can be purchased through modified-rebuys that attract lower risks than in a new-task situation.

The main barriers to innovations highlighted in the study are building regulations and price agreements that substitute innovative products specified by architects. The final conclusion is that long-term relationships lower the risk but also can be seen as a compromise on innovation and innovative design.

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