

# APPLYING THE KRALJIC MODEL TO THE CONSTRUCTION SECTOR: THE CASE OF A PREFAB HOUSING FACTORY

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The purchasing strategies in the construction industry have been considered by many writers in construction management as short-term and arms-length. However, a different picture is portrayed in the manufacturing industry, where the purchasing strategies are mostly long-term to secure supply for production. Industrialized building is at the crossroad between construction and manufacturing, which raises the question of what purchasing strategies are applied. The purpose of this study is to investigate how the Kraljic model (1983) can be applied in an industrialized housing factory. The purchasing strategies were studied through interviews with the CEO of a timber housing manufacturer in northern Sweden. Industrialized housing manufacturers can take advantage of standardized construction systems and secure production flows that eliminate waste and improve quality. Evidence proves that long-term relationships similar to those in the manufacturing industry also exist in the construction industry regarding factory production. The analysis of these strategies suggests that the total product offer, including logistic services, plays an important role in choosing supplier.

Keywords: construction materials, industrialized housing, purchasing strategies.

## INTRODUCTION

The purchasing cost consists of a significant part of a company's total revenue (Baily and Farmer, 1986). Purchasing is therefore an important management function, and is responsible for the interface between the company and different suppliers. The responsibility of the purchasing management team involves evaluating the markets and the risks involved with all its opportunities and obstacles.

The more developed the production process, the more dependent the company is on long-term relationships for a secure supply (Baily and Farmer, 1986). In the manufacturing industry, close collaboration between the major supply chain components, e.g. manufacturing and suppliers, is crucial for success (Tan et al. 1999).

The supplier-buyer relationship in the construction industry is considered to be arms-length (Dubois and Gadde, 2000). However, supplier strategies concerning the specific products in industrialized housing have not been investigated in detail. This study aims to classify the different strategies for different construction materials into a more detailed pattern for strategies of each specific purchased product. Gelderman

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(2000) claims that moving to different, more attractive positions in the matrix, is a way to develop a company's purchasing strategies. Little research of how purchasing portfolios like the Kraljic model (1983) have been applied in different industries has been carried out (Olsen and Ellram, 1997). Therefore, the aim of this article is to develop the Kraljic model (1983) into a management tool for business professionals in the construction industry.

The purpose is to investigate how the Kraljic model (1983) can be applied in an industrialized housing factory. Hence, an increased understanding will be obtained in the differentiation of purchasing strategies of different products. The purpose is investigated through an interview with the CEO of an industrialized housing manufacturer of timber houses. The company manufactures vacation houses, villas and multi-storey residential buildings.

## CLASSIFICATION OF PRODUCTS BASED ON PURCHASE MANAGEMENT WRITINGS

Kraljic (1983) classified the purchasing strategies for different kinds of products. The products are divided into four different types: non-critical items, leverage items, bottleneck items and strategic items. An explanation of the different types of products is found in Table 1.

*Table 1: Classification of products according to Kraljic (1983)*

Type of product / Characteristics	Non-critical items	Leverage items	Bottleneck items	Strategic items
Procurement focus	Low-value	High value (quantity)	Low value (small volume)	High value (high complexity)
Key performance criteria	Functional efficiency	Cost/price and materials flow management	Cost management and reliable short-term sourcing	Long-term Availability
Time horizon	Short	Medium	Medium	Long
Supply	Rich	Rich	Scarce	Scarce
Alternative suppliers	Many	Many	Few	Few/None

Non-critical items have a low value and several possible alternative suppliers (Kraljic, 1983). A common problem with this product category is that the handling of the products costs more money than the product itself (Van Weele, 2005). Ouchterlony (2007) argues that most construction materials from on-site construction are placed here. However, Van Weele (2005), states that non-critical items are products not used in production.

Leverage items are raw materials or primary products obtained from various suppliers at various qualities. Because these products are bought in large quantities, the price and logistics are important (Kraljic, 1983). Price is probably the most critical issue in the purchasing process, especially regarding commodity markets where raw or primary products are exchanged (Van Weele, 2005).

Bottleneck items have a low value in relation to the total profit, but can be hard to find because of a scarce supply (Kraljic, 1983). Few products from the construction

industry and on-site construction are in this category (Ouchterlony, 2007). On the whole a company should avoid having suppliers in this category (Gelderman and Van Weele, 2002).

Strategic items are complex products with few suppliers in the market. These items are purchased most successfully through long-term relationships. Construction companies are dependent on reliable suppliers as a consequence of their interdependencies in the construction system (Giado, 1996). According to Ouchterlony (2007), service installations fall into this category. If a supplier is not involved in, e.g. the design of the drawings, the construction company has to invest extra time and resources to solve problems caused by not sharing information (Sanchez and Pérez 2001). Close and long-term relationships with suppliers are therefore vital, not only at a logistical level, but also at the technological/strategical level (Lamming 1993). It is important that contracts are written properly to avoid future conflicts in a strategic items strategy, since switching from this kind of supplier is difficult (Walker and Weber, 1987).

According to Cox and Ireland (2001), construction components range from raw or primary products to complex systems that require skilled craftsmen to install. Dubois and Gadde (2000) argue that building materials are primarily characterised by the exchange of standardised products that are components of more complex systems. The switching costs relate to the costs of changing supplier, and the more customized the product, the higher the switching costs (Jackson, 1985). Switching costs are not just the financial costs, but also the cost of effort and an emotional cost that is higher in long-term relationships (Jones et al., 2002).

Figure 1 shows the Kraljic model (1983), with the different items concerning risk and value. Non-critical items have low risk and low value, leverage items have low risk and high value, bottleneck items have low value, but high risk, and strategic items have high risk and high value.

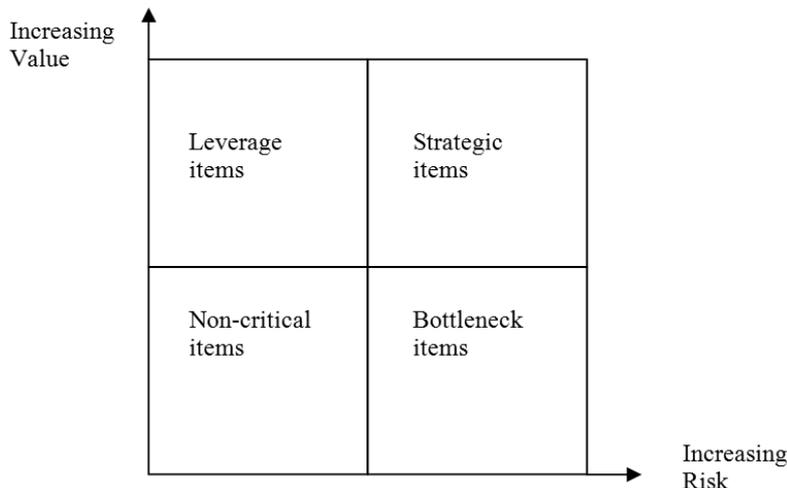


Figure 1: The Kraljic model (1983)

## CASE STUDY: PURCHASING STRATEGIES AT AN INDUSTRIALIZED HOUSING FACTORY

The case company studied is a manufacturer of timber houses, including vacation houses, villas and multi-storey residential buildings. The company is situated in northern Sweden and has an annual turnover of 4.8 million Euros. The factory

produces timber panels that are assembled as a complete structure at the construction site. The case company is only responsible for the production of the house shell components, and not, for example, the foundation and interiors.

The CEO of the house manufacturer was interviewed by telephone about the company's purchasing strategies. The CEO then verified the answers to guarantee validity. The values of the purchased materials were taken directly from the company's bookkeeping accounts. The questions were:

- What construction materials do you purchase?
- What is the annual purchasing cost of each component?
- What is the total purchasing value in SEK for a year?
- Who are the suppliers for each of the components?
- Do you often shift suppliers of some materials or do you have long-term relationships?
- Why have you chosen these particular suppliers?
- How satisfied are you with your suppliers? (scale 1-3, 1=dissatisfied, 3=very satisfied) Why are you satisfied / dissatisfied with them?
- Is it easy to shift supplier for the different materials (scale 1-3, 1=easy, 3=hard)?
- What is the level of material customization (scale 1-3, 1= low, 3=high)?
- Do you have few or many alternative suppliers?
- Is there a problem with long lead-times for any of the materials?

*Table 2: Investigation of construction materials at the case company*

Type of product	Percentage of total purchasing	Source	Time Horizon	Level of satisfaction with supplier	Switching costs	Level of customer adaption	Alternative suppliers
Insulation	21 %	Local distributor	Long	Medium	Low	Low	Few
Windows	18 %	OEM	Long	Low	Low	Low	Few
Timber	15 %	OEM	Long	High	Medium	Medium	Few
Project specific items	13 %	Varies	Short	Varies	Low	Varies	Many
OSB-boards	7 %	Local distributor	Long	Low	Low	Low	Few
Inner floors and walls	6 %	Local distributor	Long	High	Low	Low	Few
Gypsum boards	5 %	Local distributor	Long	Medium	Low	Low	Few
Stairs	4 %	OEM	Long	High	Medium	Medium/high	Few
Doors	3 %	OEM	Long	High	Low	Medium	Few
Moisture barriers	3 %	National distributor	Long	Medium	Low	Low	Few
Outer roof	2 %	Local distributor	Long	Medium	Low	Low	Few
Rafters	2 %	OEM	Long	Medium	Medium	High	Many
Paint	< 1 %	Local distributor	Long	Medium	Low	Low	Many
Nails	< 1 %	OEM	Long	Medium	High	Low	Few
Installations	< 1 %	Local distributor	Long	Low	Low	Low	Few

The answers were then derived into Table 2. The total purchasing value of the materials is 50%, including transports of the total turnover. Many suppliers are local distributors (see Table 2) and the CEO says that this is the only way to handle the factory's low sales volumes. Excessive warehouse stock is otherwise eventually destroyed. It is also harder to handle quality issues when moving around excessive stock inside the factory. The local distributors were chosen because of their total offer regarding logistics rather than price. The only products with market variations that occasionally can extend the lead-time were windows and insulation.

Table 2 illustrates a pattern that mirrors the purchasing strategies of the case company. The choice of supplier is based on the character of the product and logistics offering. Below are some explanations and reflections regarding Table 2.

All standardized commodity products like insulation, gypsum boards, and OSB boards are bought from local distributors via call-offs. Insulation represents the biggest share of the total purchasing value. Paint, installation equipment, inner floors, inner wall clothing, and outer roofs are also from local distributors. The case company is not completely loyal to the supplier of installation materials and OSB-boards due to the high price.

Moisture barriers are the only commodity product that is not bought from a local distributor, but from a national distributor.

In general, all products with some kind of customization are bought directly from the OEMs. The timber is bought from a local sawmill. The sawmill specializes in sawing timber that is tailor-made for industrialized housing, which the housing company is very satisfied with. Stairs and rafters are bought from local carpenters that offer customized products. Nails are in fact a customized product. That is because changing supplier of nails to the nail guns does mean a transaction cost because each brand of nail gun has its specific nail, i.e. changing nail supplier means also changing all nail guns in the factory. Windows, however, are an exception from being customized OEM-products. These are purchased at a very competitive price from an OEM, but lack quality and the window supplier offers no customization.

Project specific items represent a large share of the case company's purchasing value. These items can be anything extra that the customer requests, for example glass balconies. As these items are very specific to each project, the suppliers vary for each construction project.

## **EVALUATION AND CATEGORIZATION OF PURCHASING STRATEGIES**

The products investigated at the housing factory are mainly in the leverage quadrant of the Kraljic model (1983). This is because construction materials are mostly commodity products (Dubois and Gadde, 2000). The findings from the case study conclude that in the industrialized housing industry, the relationships between buyer and seller are principally of a long-term nature (see Table 2). This suggests that industrialized housing (off-site construction industry) has more long-term supplier relationships than the on-site construction industry with its arms-length relationships (Dubois and Gadde, 2000; Ouchterlony, 2007; Wood et al., 2005; Cox and Thomppson, 1997).

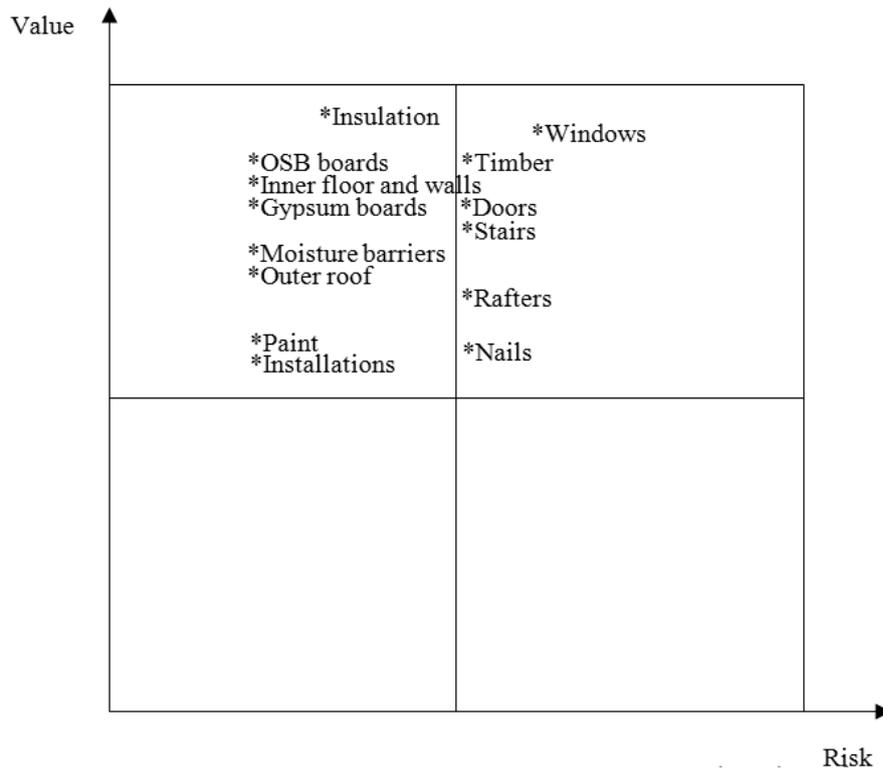


Figure 2: Classification of items into the Kraljic-1983 matrix

Figure 2 shows the purchased items in the Kraljics model (1983), except for project specific items that are constantly bought from different suppliers.

Commodity products bought from the local distributors are placed in the leverage square. Insulation is the largest parts of this category and is placed slightly more to the right, as their lead-times due to market variations can be sometimes long. This creates a more unpredictable supply and thus a higher risk. The remaining commodity products are placed in the middle of the leverage square. This is due to the risk of being dependent on a few suppliers that can offer them the same logistic solution they have now.

Doors, timber, stairs, rafters and nails are more customized products and are therefore placed in the strategic square. Although the products are classified as strategic items, the risk is not critical because of other possible suppliers that are available. Therefore, these products are placed to the left of the strategic square.

Windows are a non-customized product which according to the CEO needs customization. This fact suggests shifting supplier and move towards the strategic square. The lead-time can sometimes be long for windows, due to market variations, which places windows slightly more to the right in the strategic square than the other strategic items.

## DISCUSSION

Earlier research states that the construction industry supply chain is lagging behind that of the manufacturing industry (Gann, 1996). However, the supply chain of the industrialized housing industry does show signs similar to the supply chain of the manufacturing industry. A housing factory has a construction system that always needs the same products, i.e. a steady supply of the same products with long-term supplier relationships just like the manufacturing industry.

Constantly evaluating suppliers of different categories in the Kraljic model (1983) is a way of updating the composition of the supplier portfolio. However, a company should always reconsider before going too much to the right in the strategic square, because it is riskier to be dependent on a sole supplier. It is also risky to be placed in the bottleneck square, which should always be avoided. Non-critical square should not contain any items related to production.

The leverage strategy is suitable in factory production, because the logistic system is critical to production flow. These extra logistic services can in this case company only be obtained through local distributors. A strategic item strategy simplifies production flow through customized products (Mitchel, 2009). Customized products are typically only available from the original manufacturer, as retailers usually only have standardized sizes.

### CONCLUSIONS

In conclusion, a "hybrid" of the strategic items' square and leverage items' square is the way an industrialized housing factory goes with construction materials in Table 2. Basically, two groups of products are derived: standardised products and customized products. OEMs are needed for customised products as well as a need to collaborate in developing logistic strategies with local distributors for standardized products. Both groups thrive towards the centre, suggesting a midway strategy in a modified version of the Kraljic model (1983). The midway strategy suggests close collaboration with few suppliers, which gives benefits in technical and logistical collaboration even though it is risky. Rehme et al. (2005) modified the Kraljic model (1983) to integrate marketing theories concerning close relationships versus arms-length relationships. The modified Rehme model (2005), Figure 3, is meant to visualize common purchasing strategies in the Swedish manufacturing industry through studies of Ericsson and ABB. The results of the study of the industrialised housing factory coincide with the Rehme model (2005), which is an interesting scenario. This suggests that the purchasing strategies of the industrialised housing factory show signs similar to those in the manufacturing industry.

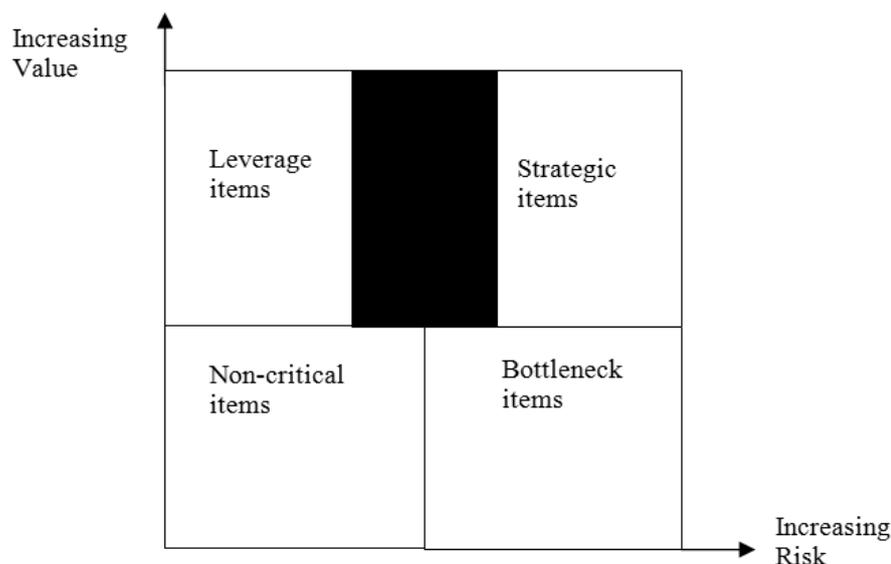


Figure 3: A modified version of Kraljics-1983 matrix (Rehme et al., 2005)

The midway strategy implies collaboration to ensure a secure supply. At the same time, there is a need to be arms-length when it comes to core competence, as the

construction system should be well-guarded to not give too much power to the suppliers. It can be concluded that the purchasing strategies in industrialized housing are similar to the long-term purchasing strategies of other manufacturing industries. Because there is a constant need and use for material, industrialized housing can take advantage of its purchasing clout. Traditional on-site construction typically has no warehouse, since their production unit is constantly moving around. Nevertheless, on-site construction companies can perhaps learn something from the industrial housing industry in working more closely with the same suppliers to develop products and logistics effectively. By applying the Kraljic model (1983), further research to other companies in the construction industry can be advantageous.

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