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A FRAMEWORK FOR UNDERSTANDING PURCHASING IN BUILDING CONSTRUCTION COMPANIES

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ABSTRACT

Purchasing on the part of a building construction company involves actors inside and outside the organization. These actors are driven by different motives that influence purchasing decisions in different situations. An explicit framework that assists in understanding the different purchasing situations would be of benefit to companies and researchers. Through a study of purchasing theory and practices, including interviews with a number of building construction companies, a framework of purchasing is proposed. The framework covers all stages in the purchasing process and focuses on four factors: (1) purchasing situations; (2) level of complexity; (3) active roles; and (4) supply chain involvement. The interrelationships between these factors are discussed from the perspective of the companies.

Keywords: purchasing, buying centre, actors, roles, building construction

INTRODUCTION

Building construction projects require a wide range of capabilities that can rarely be found within a single organization, necessitating links to the technological capabilities of others (Gann and Salter, 2000). An increasingly important capability involves the purchase of products and services that can account for a large proportion of the total cost of the project (Axelsson, 2005). Purchasing also influences quality (Proverbs and Holt, 2000, Karim et al., 2006) and time (Kumaraswamy and Matthews, 2000) and so plays a significant part in determining the outcome of the project. Purchasing within a building construction company can be characterized as an amalgam of traditional practices, which might have served the company well over a long period, ongoing developments such as the introduction of supplier relationship management (Cox,

2004), strategic purchasing (Carr and Smeltzer, 1997) and the purchase of innovation through new products and services (Castaldi et al 2011).

Purchasing includes decisions on whether to use a new subcontractor, a new component or a new process. How building construction companies manage these and other purchasing situations is not, however, well documented; yet, it is important to understand how companies utilize their own capabilities, as well as those of their suppliers and subcontractors. The availability of a framework to represent different purchasing situations in building construction would be beneficial, enabling an exchange of experiences and views that might pinpoint inefficiencies and suggest improvements. An explicit framework that assists in understanding the different purchasing situations found within building construction might therefore be useful for companies and researchers.

This paper presents findings supporting the definition of a framework deduced from purchasing theory and tested among a select number of companies as an important step in formalizing understanding of purchasing situations in building construction. The starting point of the study was a simple question: is there a framework to portray purchasing in building construction that would be recognized by companies as capturing their individual purchasing situations? If so, what might this framework look like? The context is building construction companies' purchases of products that include new services from suppliers and subcontractors, as well as new processes within the project.

PURCHASING

Concepts of purchasing

The seminal work on purchasing by Robinson et al. (1967) identified different purchasing situations: (1) new-buy; (2) modified rebuy; and (3) straight rebuy, known as the BUYGRID classification. A new-buy is a purchasing situation that occurs when a 'new to firm' product is purchased and where the need for new suppliers is being considered. A new-buy generally presents significant challenges, not least in identifying needs correctly. A modified rebuy is when the product is known but something in the supplier offering has changed from previous purchases or it might involve a new supplier altogether. They are project-specific. Straight rebuys are recurrent situations involving known products that do not require any new information and which are handled on a routine basis with little or no motivation for finding

new suppliers. Figure 1 illustrates how different purchasing situations occupy different parts of the purchasing process.

Stages in the purchasing process					
Identification of need	Establishing specification and scheduling the purchase	Identification, evaluation and selection of supplier	Negotiation and contracting	Issuing the contract or order	Following up to secure delivery
New-buy					
	Modified rebuy ¹⁾				
				Straight rebuy	

Figure 1: Different purchasing situations occupy different positions within the purchasing process (abstracted from Van Weele, 2010)

¹⁾ A modified rebuy is project specific and a change in something existing

The BUYGRID classification was further developed into the ‘buying centre’ (Webster and Wind, 1972), which is a framework of actors whose roles affect the purchasing process inside and outside the purchasing organization. The influence of different actors can depend on the environmental, economic, political, social and technical context. The concept of the buying centre has been studied by several researchers. For example, Bellizzi and McVey (1983) examined 140 US building contractors’ perceptions of influences in different purchasing situations and found that much depends on the nature of the product, **especially** its cost rather than *newness*. Kohli (1989) investigated how individuals in the buying centre exerted power in new-task situations across different manufacturing industries in the US involving more than 250 purchasing decisions. Kohli’s investigation found that *expert power* had the greatest influence inside large buying centres that were not under pressure of time and when there were few attempts to influence decisions. Conversely, *reinforcement power* was found to have a strong influence inside small organizations under pressure of time. Other kinds of power, namely *referent power*, *departmental power* and *information power*, tended to play smaller roles. Bunn (1993) developed an extension of purchasing situations into a framework based on four situational factors: purchase importance, purchase task uncertainty, extensiveness of

choice and perceived purchaser¹ power. In addition, her framework considered purchasing activities, namely search for information, analysis techniques, proactive issues and reliance on control mechanisms. Since building construction projects bring together many organizations and the actors within them, their influence in different purchasing situations is of particular interest.

Novel purchases

At the level of ‘new to firm’, the BUYGRID classification represents the different degrees of newness of a purchase, with new-buys and modified rebuys constituting some degree of change. The BUYGRID framework can be related to innovation and, in turn, arguably the most widely cited definition of innovation in construction, provided by Slaughter, can be related to purchasing: “the actual use of a nontrivial change and improvement in a process, product, or system that is novel to the institution developing the change” (Slaughter, 1998:226).

By combining the contributions of Robinson et al. (1967) and Slaughter (1998), new-buys and modified rebuys can be seen as innovations since they are novel to the organization – an interpretation that is consistent with the oft-quoted definition of innovation by the OECD: “the implementation of a new or significantly improved product (goods or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations” (OECD, 2005:46). Hence, a new-buy involves a new product from a new supplier which makes the purchasing process, i.e. the purchaser-supplier relationship, and the purchased product new. The definition of an innovation can thus be extended to involve a relationship. This is also in line with the OECD (2005) definition, covering new ‘external relations’ and, in the construction context, it aligns with Bröchner (2010) who includes new relationships and new services in his definition of an innovation. Services can, in the same way as products, be analysed through the BUYGRID classification.

¹ Purchaser, or buyer, is the person having day-to-day responsibility for purchases of products and services within the purchasing organization.

New-buy, modified rebuy and straight rebuy in building construction

Depending on the newness of a purchase, different activities are involved. A new-buy involves more tasks than a modified rebuy or straight rebuy. In line with Dawes et al. (1998), who studied the buying centre of different firms when purchasing ‘new to firm’ products, the purchasing of a novel product or service can generally be considered to be more complex than a straight rebuy because of a, typically, lengthier process. Moreover, technical personnel were found to have a significant impact on the purchasing decision. The uniqueness of each end-product in building construction leads more or less to a ‘new-buy situation’ for each project. This is because the designer has to specify the products in the design of each new or refurbished building. The designer can be seen as a driver of change and someone who pursues new products. In the designer’s eyes, purchasing is always a ‘new-buy situation’ that involves the collection of information about the design, the context in which certain products are to be used and supporting technical specifications. Even so, a study of three building construction projects in southern Sweden by Bildsten (2013) revealed that most products had been used before, particularly in relation to the building’s shell. New products and new suppliers were proposed for a small percentage of specified products. When it comes to supposedly new products from known suppliers, the study found that almost all products represented a modification of something existing, typically a standard product; therefore, these purchases could be classified as modified rebuys. These represent a change in something existing and would normally be expected to involve less effort and time than new-buys. Purchases by the project team are, in general, adapted to each project and so are categorized as modified rebuys. Examples are those that involve a service such as plumbing, mechanical and electrical installations.

Some bulk materials and standard services are called off just-in-time from suppliers with which the company has a framework agreement, based on a preferred list of suppliers from whom it expects to achieve greater cost efficiency. These products (i.e. materials and services) can be categorized as straight rebuys. Frödell et al. (2013) undertook a study of a large building construction company in Sweden that aimed to implement straight rebuys for 50% of its total purchasing volume. This was achieved by concentrating purchasing into framework agreements. The straight rebuys were, however, found to be difficult to incorporate as the framework agreements had a subordinate status when compared with purchase orders generated

by the project team². Inconsistent ways of working within the projects, suppliers finding it hard to adapt their ways of working, products specified by clients, the geographical distribution of suppliers and market changes over time were barriers that led to the company to reject centralized purchasing for the main part in favour of purchasing on the project level.

The above discussion suggests that the level of newness of purchases in building construction is rather high, as modified rebuys account for a significant proportion of the purchasing value. Furthermore, 'newness' requires the presence of technical expertise in evaluating alternative products and suppliers.

Purchasing as a process

Robinson et al. (1967) conceptualized the activities of a purchase in general in the form of a process starting with: (1) anticipation of a client's need; (2) determination of the characteristics and the quantity of the item needed; (3) description of the characteristics and quantity of the item; (4) search for and qualification of potential sources; (5) acquisition and analysis of proposals; (6) evaluation of proposals and selection of suppliers; (7) selection of an order routine; and (8) performance feedback and evaluation. Webster and Wind (1972) emphasized the first part of the process in terms of a classification of decision-making stages: (1) identification of need; (2) establishing specification and scheduling the purchase; (3) identifying purchasing alternatives; (4) evaluating alternative purchasing actions; and (5) selecting the suppliers. Van Weele (2010) consolidated the eight stages defined by Robinson et al. (1967) into five: (1) specification; (2) selecting the supplier; (3) negotiation and contracting; (4) issuing the contract or order; and (5) following up to secure delivery. By combining the above frameworks of purchasing, an alternative process can be extracted: (1) identifying the need; (2) establishing the specification and scheduling the purchase; (3) identifying purchasing alternatives; (4) evaluating alternative purchasing actions; (5) selecting the supplier; (6) negotiation and contracting; (7) issuing the contract or order; and (8) following up to secure delivery. This conceptualization is persuasive because it is a direct way of portraying purchasing and is reflective of building construction industry practices (see Table A1). There

² Project team covers those personnel employed by the building construction company and deployed on the project under the leadership of a project manager or equivalent.

is a connection between this purchasing process and the innovation process, which Barrett and Sexton (2006:342-3) highlighted when they defined the process of innovation in small- and medium-sized companies as “behavioural in nature, being a cyclical process of diagnosing, action planning, taking action, evaluating and specifying learning. The cycle starts with sensing an opportunity or need to innovate in response to market, project and/or client conditions”.

This cycle has similarities with the stages in the purchasing process in determining needs and in diagnosing and taking action on alternative purchases. Novel products and services can be seen, therefore, as an integral part of a process of continual improvement to be implemented at any time in regard to existing products and their associated services. Bildsten (2013) found that the purchasing process was facilitated by established relationships with suppliers participating in the specification stage. The suppliers contributed their technical knowledge so that the designer and suppliers could *cocreate* building solutions. The selection of suppliers was found to be challenging, because the designer had his or her supplier relationships while the company had its own. In effect, the company was attempting to change the products originally specified by the designer. The purchasing decision was further influenced by clients who stressed that it was important to have guarantees for products and workmanship, as well as competitive bidding to secure the lowest price.

To ease understanding of the purchasing process, straight rebuys can be regarded as offering the most direct approach. However, cost-saving/value-adding options are not considered, neither is the opinion of the designer. Nevertheless, straight and modified rebuys might dominate purchasing because of uncertainty as to whether or not new products and services meet regulatory requirements, thereby reducing the incidence of novel design solutions (Tatum, 1987). This situation inhibits purchases from new suppliers who might be unfamiliar with requirements and how to satisfy them. If a new supplier is to be considered, products from that supplier must be shown in the context of a successful, finished project (Bildsten, 2013). In addition, price agreements – implying straight rebuys – with some suppliers must be followed strictly, making it difficult for new suppliers to be considered. It is argued that negotiation and contracting have become more efficient through long-term price agreements with suppliers of multiple products (Swift, 1995); but, clearly, this has the potential to prevent purchases from new suppliers.

Complexity of the purchasing process

The purchasing process can become complex due to decision making and communication that takes place over time, involving several project actors and relationships with external organizations. Webster and Wind (1972) defined organizational purchasing as “the decision-making process by which formal organizations establish the need for purchased products and services, and identify, evaluate, and choose among alternative brands and suppliers”. They argued that organizational purchasing is more complex than consumer buying for the following reasons: (1) more people are involved and occupy different roles; (2) purchasing decisions often involve technical complexities related to the purchased product or service; (3) purchasing decisions often need long evaluation due to uncertainty, large sums of money and long-term commitments; (4) the lengthy process is hard to coordinate with lags between marketing efforts and purchasing responses; (5) all organizations are unique in objectives, resources and capabilities; and (6) organizational members in the purchasing decision are people whose actions and behaviours are influenced by work-related and non-work related factors. Moreover, purchasing decision making is argued to be more complex than most other organizational decision processes. This depends, according to Webster and Wind (1972), on four factors: (1) the purchasing workflow, which is often crosswise in the organization rather than along the chain of command, i.e. the purchaser’s relationships are horizontal; (2) formal authority over purchasers can be in the hands of either a purchasing manager or an operating division manager (in the case of decentralization); (3) a major part of the purchaser’s work is with people outside the organization; and (4) purchasing is a service function and there is no clear-cut decision-making authority between, for instance, the engineering department and the purchasing department. Indeed, Castaldi et al. (2011) found in a study of 12 organizations from a variety of industries in the Netherlands that aligning knowledge between the purchasing function and the expertise of personnel associated with other functions can be a challenge, but is necessary when novel products or services are involved.

Alternative purchasing frameworks

Throughout the purchasing process – from the specification stage through to following up to secure delivery (see Figure 1) – some actors are generally seen to exert more influence than others (Kohli, 1989). For example, project managers can have the expertise and informational power on ‘what’ and from ‘whom’ to purchase, while reinforcement power can be exerted by designers, and previous clients of suppliers can have referent power. The influences are driven by different interests and motivations (Sheth, 1973), which can involve high complexity

(Andersson et al., 1987). Whilst Robinson et al. (1967) adopted a process view of purchasing activities, there are other frameworks that address the characteristics of an individual's influence over purchasing decisions. For example, Sheth (1973) considered organizational purchasing behaviour, highlighting the role of individual expectations associated with purchasing variables related to the product, organization, politics and broad context. Sheth proposes that a purchaser's reactions to external variables depend on each organization's unique structure. In contrast to Webster and Wind (1972) and Sheth (1973), who focused on interactions both *inside* and *between* organizations, Håkansson and Johanson (1992) adopted a supply chain management perspective to propose a purchasing framework based solely on interactions *between* organizations. By adopting an ARA model (actors-resources-activities), the content of a business relationship was described in terms of three layers: actor bonds, resource ties and activity links. These actor-resources-activities can be seen as the environmental and organizational dimension of the buying centre surrounding the individual and interpersonal relationships within each organization. Within the construction context, Håkansson and Ingemansson (2013) examined how the interaction between organizations, actors, activities and resources might transform into renewed products and processes. The types of interactions that form renewal are argued to be long-term, as opposed to purely transactional relationships based on a bidding process (Gadde and Håkansson, 1993) that often characterizes the supply chain in building construction (Bygballe et al. 2010). However, long-term does not necessarily mean a close relationship and short-term does not have to mean purely transactional or loose as Gadde and Snehota (2000) pointed out. More recently, Bildsten (2014) undertook a study of industrialized buildings in Sweden, where she found that a large proportion of purchases were long-term and loose. From an organizational purchasing perspective, the underlying causes of this behaviour were attributed to the preferences of the different actors within each organization.

Environmental, organizational, interpersonal and individual influences interact and simultaneously shape organizational purchasing behaviour (Webster and Wind, 1972). People in organizational purchasing decisions interact with one another, sharing knowledge and attempting to influence the outcome of the process to their advantage. An evaluation of the demands and influence of different actors is important throughout the design, construction and handing-over stages of building construction projects (Olander and Landin, 2005) if there is to be sufficient control over outcomes. Capturing the consequences of these actions in a framework of purchasing situations would bring clarity and attention for those managers intent

on weeding out inefficiencies as a means for achieving greater competitiveness and transparency.

Active roles

Since different people are involved in purchasing decisions, interest in organizational purchasing should not only include the purchaser (as a member of the purchasing department) but the buying centre, which includes all those individuals and groups who participate in the purchase decision-making process and who share the common goals and risks arising from the decisions. As Olander and Landin (2005) have made clear, it is essential to identify actors who affect project decisions in construction and to recognize that the nature of their engagement changes over the project life cycle (Widén et al., 2014). Through understanding the roles in the buying centre, the nature of interpersonal influences in purchasing decisions can be understood. The roles of *users*, *influencers*, *deciders*, *purchasers* and *gatekeepers* can be identified in most purchasing situations (Webster and Wind, 1972). Several individuals can occupy the same role and one individual can occupy two or more roles. Each is now discussed.

Users might exert their influence either individually or collectively. In building construction, users can be the end-user but also a client organization that initiates the purchasing process and formulates specific purchasing requirements. Whyte (2003) studied how different users in different contexts within building construction in the UK and US have diverse requirements that demand tailored solutions. Suppliers might select an existing or previous client or user as a reference for a purchasing organization (Hada et al. 2013). Users can influence purchasing decisions in a positive way by suggesting the need for certain materials and by defining standards of product quality or, in a negative way, by refusing some products.

Influencers are generally people who directly or indirectly affect purchasing or usage decisions by exerting their influence either by defining criteria that constrain the choices to be considered in the purchase decision or by providing information with which to evaluate alternative purchasing actions. In industry in general, the influence of an individual depends to a large extent on his or her expertise (Spekman, 1979). Technical personnel are known to be significant influencers of the purchasing decision, especially in situations involving the development of new products to be manufactured by the purchasing organization and in the purchase of equipment to be used in the production process, especially where new technology is concerned. Moreover, the adoption of novel products and services from suppliers has generally been argued

to depend on key individuals, so called *innovation champions* (Chakrabarti, 1974). The role of champions has also been recognized in the building construction context, see for example Nam and Tatum (1997), Barlow (2000) and Leiringer and Cardellino (2008).

Purchasers are generally those members of the buying centre with formal authority for selecting suppliers and arranging the terms of purchase. Webster and Wind (1972) noted that the purchaser might have formal authority for negotiating with suppliers and for committing the organization to supply contracts; however, the choices available to the purchaser might be significantly limited by the formal and informal influence of others. For instance, technical personnel might have authority for establishing specifications and could do so in a manner that forces the purchaser to deal with a particular supplier. The influence of the purchaser might be at different stages of the purchasing decision process; but it is especially marked when considering prospective suppliers and then in selecting individual suppliers. The purchaser's influence is affected by the nature of the purchasing task. The decision can be a routine process of applying previously established criteria to a limited range of acceptable alternatives – an essentially clerical function – or it might be more complex if there is the need to negotiate prices and other terms and conditions in formalizing the contract. In more complex situations, it might be necessary to define specifications and evaluate available alternatives to determine the most economical way of solving a purchasing problem.

Deciders are those who have either formal or informal power to determine the final selection of suppliers. Webster and Wind (1972) argued that, in general, the purchaser might decide; but it is also possible that the purchasing decision will be made by somebody else and left to the purchaser for implementation. Sometimes, it can be hard to determine when a decision is actually made and who makes it. In building construction, a *de facto* purchasing decision might be made by the designer who develops a specification that can be met by one supplier only (Van Weele, 2010). Thus, although the purchaser may be the sole person with formal authority to sign a purchase order or contract, this actor might not be the true *decider*. In a study of small and medium-sized building construction companies by Gajendran et al. (2013), the CEO made the final decision on the purchase of a new product. Purchasers usually have an upper limit on the financial commitments they are permitted to make, reserving larger decisions for other members of the organization such as the board of directors (Bellizzi and McVey, 1983). Where organizations are publicly-quoted corporations, they will be bound by financial governance that will define authorities and procedures.

Gatekeepers control the flow of information into the buying centre. They are generally seen to be important in development projects where, for instance, the technology is changing, as revealed by Tushman and Katz (1980). They defined gatekeepers as those key individuals generally in projects who are both strongly connected to internal colleagues and strongly linked to external domains. Gatekeepers are at the junction of different communication channels and are, therefore, usually in the position to regulate the flow of demands and, hence, decision outcomes (Pettigrew, 1972). According to Webster and Wind (1972), a gatekeeper in an organization might be the purchaser, who has formal responsibility and authority for managing the relationships between the organization and vendors both existing and potential. In these situations, the purchaser might have formal authority for allowing salesmen to contact the engineering department or might be responsible for maintaining a library of catalogues or their digital equivalent. There might, however, be other gatekeepers than purchasers in the organization. Technical personnel in particular are likely to be exposed to information about new products and new technology of possible interest to the organization. Bildsten (2013) found that architects gather catalogues (or their digital equivalent) for building construction projects, which might make them a gatekeeper. Vendors employed by the purchasing organization can be a significant source of information about the availability of products and services in the marketplace. General managers can also be exposed to important sources of information. Gajendran et al. (2013) noted that the CEO was typically responsible for initiating changes. This finding is in line with Webster and Wind (1972) who, far earlier, had noted that gatekeepers exert their influence primarily at the stage of identifying purchasing alternatives. Consequently, they also significantly determine the outcome of the purchasing decision.

As established earlier, users and influencers have an impact on the identification of need, establishing specifications and scheduling the purchase, identifying purchasing alternatives, evaluating alternative purchasing actions and selecting suppliers. In building construction, the client and the designer can be viewed in this process as influencers in a ‘design and construct’ contract. In a ‘design and build’ contract, the client has less involvement. This is because in a ‘design and build’ contract, the designer is employed by the building construction company (i.e. the main contractor); whereas, in a ‘design and construct’ contract the client employs the designer directly (Harris and McCaffer, 2013). In a ‘design and build’ contract, the company can have a significant impact on the above activities and throughout the remainder of the process involving negotiations, contract award and following up. Deciders, for example project managers and general managers, will place much dependency on monetary value (Bellizzi and

McVey, 1983) and can, therefore, have a large impact on determining the specification, schedule and final selection of suppliers. Gatekeepers exert their influence when identifying purchasing alternatives. This person can, depending on the nature of the contract, be the client, architect or project manager. Table 1 summarizes the roles applying to different stages in the buying centre.

Table 1: Stages and roles in the buying centre (after Webster and Wind, 1972)

	User	Influencer	Purchaser	Decider	Gatekeeper
Identification of need	x	x			
Establishing specification and scheduling the purchase	x	x	x	x	
Identifying purchasing alternatives*	x	x	x		x
Evaluating alternative purchasing actions*	x	x	x		
Selecting the supplier*	x	x	x	x	

* These three separate stages were combined as one in Figure 1.

A FRAMEWORK OF PURCHASING SITUATIONS IN BUILDING CONSTRUCTION

A framework of purchasing situations in building construction based on purchasing stages can be derived from the analysis presented thus far. The purchasing process consists of the stages of: (1) identification of need; (2) establishing specification and scheduling the purchase; (3) identifying purchasing alternatives; (4) evaluating alternative purchasing actions; (5) selecting the supplier; (6) negotiation and contracting; (7) issuing the contract or order; and (8) following

up to secure delivery. This process has been derived primarily from a synthesis of the work of Webster and Wind (1972), Robinson et al. (1967) and Van Weele (2010).

As shown in Figure 1, different purchasing situations occupy different parts of the purchasing process. New-buys occupy the whole process, whereas modified rebuys require a defined specification since they represent a change in something existing and are project specific. Straight rebuys are not project specific and simply require an order to be issued. Purchasing decisions can vary in complexity from studies required to identify and define needs, on the one hand, to simply issuing an order. Once the specification has been agreed, complexity decreases; when the supplier has been chosen the process is relatively straightforward.

The stages of the purchasing process involve different roles in the buying centre. Through defining which roles are involved in the different stages of the purchasing process, the mechanisms for implementation can be better understood. Users and influencers are present in the stage of determining the need. Purchasers and deciders are added in the subsequent stage of establishing the specification and scheduling the purchase. Deciders need to sign-off on the specification and later on the choice of supplier. In identifying purchasing alternatives, the gatekeeper is added and the decider is excluded. The evaluation of alternative purchasing actions involves the user, influencer and purchaser. The subsequent stage is where the selection of suppliers occurs and for this stage the decider is added. Later on, when the emphasis shifts to mostly administrative work, it can be assumed that it is just the role of the purchaser that is active. Identifying roles involved in the purchasing process, and classifying according to roles relating to their impact, allows managers to be aware of the organizational and interpersonal forces involved in implementation, not least where some degree of change is involved.

The construction client as the *de facto* owner of the final product will use or represent users and influence decision making by making demands according to his or her needs. The designer works as a major influencer in fulfilling the needs of the client with the help of suppliers. In the specification stage, where purchases are planned, the schedule is more or less set for the project and deciders enter the process. The level of decision making in these cases can vary between organizations, but the role of the decider is present at this stage in the form of the project team, general manager or a combination of them. Once the specification and scheduling of purchases have been concluded, the identification of purchasing alternatives occurs. In the case of a 'design and build' contract, the client has a limited say at this stage, although a designer is

always present as an influencer. All supply chain participants involved in the identification of suppliers might act as gatekeepers. The project team acts as the purchaser on the behalf of the client from specification throughout the rest of the process. In the evaluation of alternative purchasing actions, the roles remain except for that of the gatekeeper, which is no longer present. After the evaluation of suppliers, the selection of the most advantageous bid occurs. Normally, it is the project team and, in some cases, the client or designer who makes this decision. If the monetary value exceeds a certain level, the decision might also have to involve the general management of the company. Commonly, the project team as purchaser takes care of the rest of the process such as issuing the contract or the purchase order and securing delivery.

A distillation of the earlier analysis of the literature and the issues raised in the above discussion lead to the formulation of a framework of purchasing situations in building construction (see Table 2).

Table 2: A framework for purchasing in building construction

	Stages in the purchasing process							
	Identification of need	Establishing specification and scheduling the purchase	Identifying purchasing alternatives	Evaluating alternative purchasing actions	Selecting the supplier	Negotiation and contracting	Issuing the contract or order	Following up to secure delivery
Purchasing situations	New-buy	New-buy Modified rebuy ¹⁾	New-buy Modified rebuy	New-buy Modified rebuy	New-buy Modified rebuy	New-buy Modified rebuy	New-buy Modified rebuy Straight rebuy	New-buy Modified rebuy Straight rebuy
Level of complexity	High	High	Moderate	Moderate	Moderate	Low	Low	Low
Active roles	Users Influencers	Users Influencers Purchasers Deciders	Users Influencers Purchasers Gatekeepers	Users Influencers Purchasers	Users Influencers Purchasers Deciders	Purchasers	Purchasers	Purchasers
Supply chain involvement	Client Designer Supplier	Client Designer Supplier Project team General manager	Client ²⁾ Designer Supplier Project team	Client ²⁾ Designer Project team	Client ²⁾ Project team General manager (if high value)	Project team	Project team	Project team

¹⁾ A modified rebuy is project specific and a change in something existing.

²⁾ In a 'design and build' contract, the client has limited impact in these stages

TESTING THE FRAMEWORK IN THE FIELD

Design of the fieldwork

In order to test the framework (see Table 2), a multiple-case study consisting of individual cases was conducted in Queensland, Australia, where each case represented the purchasing process of one building construction company. A case study is especially suitable for examining organizational processes (Pratt, 2009) and was therefore regarded as appropriate for a study of the purchasing process. Also, as Eisenhardt (1989) observes, a case study approach is often employed as a means for building theory. Eisenhardt argues that it is important to start by identifying theoretical constructs. It is then necessary to select relevant cases, crafting instruments and protocols, and to carry out the analysis during the course of the data collection as well as after for ‘within-case’ and ‘cross-case’ patterns that can be compared to the theory.

Case selection and data collection

The companies were selected because of their business in building construction. All of the case companies acted as construction management contractors, having their own project team to formalize contracts with subcontractors responsible for different work packages (Murdoch and Hughes, 2007). Potential interviewees were identified through personal inquiry and were followed by the offer of introductions to other individuals/companies who might be prepared to contribute to the study, i.e. an example of snowball sampling (Biernacki and Waldorf, 1981). The latter has been acknowledged as creating dynamic moments where unique social knowledge of an interactional quality can be generated (Denzin and Lincoln, 2005). The goal was to have a spread of companies from large to small in order to capture similarities and differences in the purchasing process. In this sense, the snowball sampling was purposive.

Interviews were chosen as the primary method for data collection because, according to Eisenhardt and Graebner (2007), they are “a highly efficient way to gather rich, empirical data, especially when the phenomenon of interest is highly episodic and infrequent”; moreover, it might be the only way to capture strategic decision making. By interviewing people from different organizations, locations and functional areas, diverse perspectives are likely, thereby reducing the risk of bias such as convergent, retrospective sense-making and/or impression management (Eisenhardt and Graebner, 2007).

Whilst the unit of analysis was the purchasing process within the company, the unit of observation was a manager with sufficient seniority “to speak for the company” about the

purchasing process, typically the general manager, the contracts manager, a senior project manager or the managing director and chairman in two cases. A semi-structured format was adopted for the interviews, where the questions served as a guide for capturing data in order to test the framework. The different views and understanding of each interviewee were captured in a form of puzzle-solving analysis (Morgan, 1980). Each interview lasted for 45-60 minutes and was later transcribed to enhance reliability in the interpretation of the data. Details of the case companies and interviews are shown in Table 3. A minimum of one interview was undertaken per case company: in all 15 interviews were conducted with nine case companies.

Table 3: Case companies and interviews

Size category of company (number of employees)	Number of companies within size category	Number of interviews within size category
>1,000	2	6
< 250	5	6
<50	2	3

The testing of the framework was based on discussion with the interviewee and then sketching the framework from the perspective of how it appeared to work in the company, with comment ensuing. Visual language can, according to Comi et al. (2014), lead to the generation of richer data and greater involvement of interviewees. This meant that the interview could accommodate a more exacting discussion in order to obtain the necessary information for the framework. As Eisenhardt (1989) points out, the questions can be adapted as the study proceeds, thus helping to test the framework in an iterative manner, comparing theory with practice. Questions can be interpreted differently and a small discussion around each question did, in fact, serve to avoid misunderstandings and improve accuracy and reliability. Different angles to the questions were adopted to test the framework and, over the course of the interviews, the responses started to converge. The point of data saturation was achieved after nine cases and falls within the recommended range of between four and ten cases established by Eisenhardt (1989) in order to achieve data saturation. This position is supported by Yin (2009), who argued that sampling

logic and the typical criteria for determining sample size should not be used for case studies and that the number of cases is “a matter of discretionary, judgmental choice” (Yin, 2009:58) to be determined from the outcome of each successive case examined.

DISCUSSION OF FINDINGS

Each interviewee was asked about the purchasing process and its relation to different purchasing situations in line with the (theoretically-constructed) framework. All interviewees confirmed that the *stages of the purchasing process* shown in Table 2, which were deduced from theory, corresponded to practice. In general, the more information that is known about the products and suppliers then the shorter is the time that the purchasing process takes. The more products and associated services that the subcontractor includes in its package, the less complex the coordination process becomes. Depending on the *purchasing situation* (see discussion below), some stages or parts of them, such as specification and scheduling, can be carried out by subcontractors as services included with their products (e.g. electrical and mechanical installations).

The interpretation of the *purchasing situation*, i.e. new-buy, modified rebuy or straight rebuy, caused some discussion and needed to be defined in a building construction context. One definition in the context of purchasing products for use in building construction can be that a new-buy is a product that has not been used before by this company; but it could have been used by other companies. A modified rebuy is something that requires customization for each project, i.e. a design that is project specific, and a straight rebuy would be commodities that, typically, but not always have preferred suppliers, i.e. through annual, centrally-managed framework agreements.

New-buys are not commonplace and typically represent a few percent of the total cost of a project. They are more demanding of effort and time to evaluate than other purchasing situations, because of the degree of change involved and the risk that a change can present risks for the company. Decision making might have to be elevated to more senior positions in the company depending on the change in question. The impetus for new-buys often comes from the architect. Decisions in this regard might exclude the company or, in those situations where there is involvement, it might fail to include all vested interests, notably the project manager. New-buys can also arise from a desire on the part of the project manager to substitute one product for another, where it is thought that a reasonable case for an equivalent product can be

made. There might be cost and/or time savings for the company, which might or might not be passed on to the client. Occasionally, products might be sourced from foreign producers at a price that is substantially lower than those produced “locally”. Evidence that the new-buy will be fit for purpose will be a priority for the company.

Other concerns were raised by the companies about new-buys. These are best expressed as: “you do not know what you are buying until you try it”. Sometimes it is not possible to inspect and check sufficiently beforehand to satisfy all concerns. Reference sites can be useful, but even this arrangement might not remove all doubts. Some residual risk is inevitable and is recognized as characteristic of building construction. Durability, maintainability and warranty are concerns shared by the companies. The emergence of product certification – plumbing is an example – could, however, reduce information asymmetry and complexity for new-buys, because it reduces uncertainty and leads to conformity through adherence to defined standards.

Working relationships were cited by the companies as a key consideration of whether or not to opt for a new-buy. The number of suppliers and subcontractors in the marketplace with the necessary capability and capacity are factors that have to be borne in mind. Longstanding relationships with subcontractors tended to help in making a decision to opt for a new-buy, because of the understanding and trust that had been built up over a number of years. It is also the case that some subcontractors are seeking to build a long-term relationship so might be keen to demonstrate their willingness to work together on a new-buy – a case of gain/pain sharing. Subcontractors nominated by the architect might, however, be an entirely different matter, with the company feeling that it is being forced to work with an unwilling partner who will maintain a direct line with the architect.

Modified rebuys generally account for a majority of the cost of a project. They are project-specific and a change in something existing. Quite what the change entails will need to be determined. Concerns were expressed over modified rebuys because of experiences where the implications of the changes were not always fully considered by the architect in consultation with a specialist. In extreme cases, excessive work has resulted from what might be fairly described as “reinventing the wheel” in the desire to have something “just that bit different or special”. The cost, time and quality implications need to be fully explored before proceeding. Often, one of these variables is not evaluated sufficiently. Nonetheless, modified rebuys are normally less demanding of time and effort in the purchasing process than new-buys.

Straight rebuys often account for around 10% of the cost of a project. They tend to be commodities, for example bulk materials such as steel reinforcement, cement and aggregates. Many straight rebuys are sourced through subcontractors, making it difficult for the company to leverage bulk discounts and other, more favourable terms. The subcontractors deliver the complete work package and carry most of the risk. Where the company is the purchaser then framework agreements can be negotiated, with call off on an individual project basis. This can be seen as defining the split in responsibilities between centralized and decentralized purchasing, where the head office negotiates prices and terms, and the projects order according to their individual requirements. Centralized purchasing agreements take some control away from the projects which can result in errors that the project then has to resolve. In this regard, it is important for project managers to understand when framework agreements are in place and under which circumstances they are permitted to order from other suppliers. As a rule, standardized, i.e. *non-project-specific*, products are easier to manage under centralized purchasing, but this might not be true in every situation.

The *level of complexity* decreases as key decisions are taken during the course of the purchasing process. At the start of the purchasing process, there can be uncertainty on how to build what is proposed by the designer. When evaluating and creating specifications, it is necessary to consider if the design is buildable or not. Doubts here would put the company at risk. The company, as main contractor, bears the ultimate responsibility for the building's materials and workmanship. Decisions at the point where the design is agreed are therefore important and can be validated by the involvement of *deciders* such as the general manager to sign off after verifying the specification. The choice of subcontractors is also important in this regard, because if they do not perform in terms of quality, and according to the schedule, it would have a direct impact on the company's own performance. It is, therefore, important to choose a subcontractor that has the capacity to perform, whilst recognizing that smaller subcontractors can be more flexible and might produce more original solutions. Nevertheless, a common scenario is to choose a subcontractor that has been used before as it is a 'known quantity'. In some situations, however, a particular subcontractor might not be available or, perhaps, there are others offering more competitive prices; in such cases, it might be necessary to try another subcontractor. The new subcontractor will then be carefully evaluated, checking past performance with other companies as well as their financial stability. Contracts normally include provision for retention money to be held until the work has been completed; however, retention money does not necessarily secure the services of the subcontractor to ensure

completion of every aspect of the work. It is sometimes the case that a struggling subcontractor feels it is more financially expedient not to complete the work. The choice of subcontractors is therefore important and often, as with the specification, there needs to be sign off by the general manager in the role of a *decider*. On the basis of the above discussion, it seems as if the level of complexity and risks are higher in the beginning and therefore require approval at two decision gates in the purchasing process: (1) specification and (2) selection of suppliers, where complexity is highest before the specification is agreed, moderate until suppliers are selected and, thereafter, low. This coincides with the theoretical findings on the buying centre, where the *decider* needs to be involved for approval of the specification and then the selection of suppliers.

Active roles and *supply chain involvement* are treated together as they are interrelated. The active roles are taken from the theory of the buying centre and are identified as supply chain involvement in the specific context of building construction. The client represents users and influences decisions by making demands according to his or her needs. Designers are seen as influencers in fulfilling the needs of the client. Project teams are seen as purchasers as this is a framework from the company's perspective in its relationship with suppliers and subcontractors. The general manager is, as previously mentioned, acting in the role of a *decider*. A common remark among the interviewees was that the client's involvement differed according to whether it was a 'design and build' or a 'design and construct' contract. The distinction is drawn on the basis of whether the designer is employed by the company, i.e. 'design and build', or by the client, i.e. 'design and construct'. The interviews revealed that there was a power difference between having the designer "on the company's side" or "on the client's side", as the designer belonged to "us" or "them".

Under a 'design and construct' contract, the designer might have a larger impact as an *influencer* on design-related products and services since the client employs the designer and every change from the agreed specification needs to be negotiated with the company. The designer can, in this case, be seen as a driver of change that is design-related. When the products are not design-related, the company has the power to decide about who to work with. Changes involving building in a different and better way can therefore originate from the influence of the project team. The most powerful actor in purchasing decisions within the company is typically the project team. Sometimes, however, the value of the purchase also has an influence on whether or not the general manager would have to sign off. In the larger companies, the project team

seemed to have more autonomy in its relationship with the general manager concerning purchases of low value. Once suppliers have been chosen, the role of the client or user is taken over by the company, acting as a purchaser on behalf of the client, being responsible for purchases and, as such, coincides with what has been derived from the theory of the buying centre.

The framework provided a useful guide for the fieldwork. It gave structure and content for the discussions with the companies. The fieldwork added value by providing a more developed understanding of the dynamics surrounding each of the four factors discussed above. No new factors were uncovered during the fieldwork. This was unsurprising given the meta-analysis undertaken in synthesizing the literature.

CONCLUSIONS

A framework portraying building construction companies' purchasing situations has been presented. The framework was derived from purchasing situations identified in the literature, i.e. deduced from theory, and tested in discussions with representatives of a select number of building construction companies. From this empirical study, we are able to conclude that the framework is recognized by those companies as capturing their individual purchasing situations. Since it is a framework, it cannot be expected to detail every facet of purchasing in building construction; but that was not our purpose. Nonetheless, the framework provides a definition of purchasing situations found in building construction companies of various sizes in a particular region where construction activity could neither be described as insignificant nor unusual. Our findings also confirm that four factors have to be addressed by the companies if purchasing is to contribute to project success: (1) classifying the purchasing situation; (2) assessing the level of complexity; (3) identifying active roles; and (4) involving the supply chain. These factors are summarized below in terms of their practical implications for the companies.

The *stages in the purchasing process* could be more efficient and effective and, therefore, add more value through greater knowledge of products and suppliers. This knowledge seems to reside close to where production is carried out, i.e. within the project team. Knowledge about suppliers and products requires long-term relationships that do not necessarily have to be formalized. In terms of the *purchasing situation* and *active roles*, i.e. *supply chain involvement*, new-buys and modified rebuys are handled by the project team, as this requires expertise on

how to build in order to satisfy the needs of the client. Through decentralized purchasing, where decisions are made primarily by the project team, an environment to accommodate change can be created. Centralized purchasing, with straight rebuys, has been argued to make the purchasing process more efficient in building construction and is a common approach in manufacturing industry. It seems, however, challenging to incorporate this practice into building construction since each project is unique. Straight rebuys appear to be possible only when it comes to commodities, which are used across many projects. The decision to centralize or not therefore involves a trade-off between customization and standardization.

In order to handle *level of complexity*, it is important that the key decisions have been agreed. *Active roles* such as users, influencers, purchasers, deciders and gatekeepers, who share the common goals and risk of the purchase, need to be identified in each purchasing decision. In order to create an efficient purchasing process, it is important that the goal is clearly defined for all roles. This can be represented by decision gates in which the decider is active in signing off what has been agreed. It is important that the *decider* (typically the general manager) allows the *influencer* (typically the project team) to have an informal role in decision making as this person has knowledge of how to create value-added solutions. The designer and client are strong influencers and can enforce the use of new products and suppliers; however, such a decision cannot be influenced by the power within the company. Even so, the project team needs to determine how to build and source products. Managers should therefore be aware of the value-adding capability of the project team in their decision making.

Avenues of future research include testing the framework in other regions and contexts, as well as considering other types of contract such as partnering or alliances to determine if purchasing situations are sufficiently captured by the framework.

REFERENCES

Andersson, E., Chu, W. and Weitz, B. (1987) Industrial purchasing: an empirical exploration of the buy-class framework, *Journal of Marketing*, 51 (3), 71-86.

Axelsson, B. (2005) From buying to supply management at Nordic Construction Company (NCC). In: Axelsson B., Rozemeijer F. and Wynstra F. (eds) *Developing sourcing capabilities: creating strategic change in purchasing and supply management*. Wiley, Chichester.

- Barlow, J. (2000) Innovation and learning in complex offshore construction projects, *Research Policy*, 29 (7-8), 973-989.
- Barrett, P. and Sexton, M. (2006) Innovation in small project-based construction firms, *British Journal of Management*, 17 (4), 331-46.
- Bellizzi, J.A. and McVey, P. (1983) How valid is the buy-grid model? *Industrial Marketing Management*, 12 (1), 57-62.
- Biernacki, P. and Waldorf, D. (1981) Snowball sampling: Problems and techniques of chain referral sampling. *Sociological Methods and Research*, 10 (2), 141-63.
- Bildsten, L. (2013) Purchasing decisions: enablers and barriers to innovation in construction, *Proceedings of the 19th International CIB World Building Congress*, Queensland University of Technology, Brisbane, Australia.
- Bildsten, L. (2014) Buyer-supplier relationships in industrialized building, *Construction Management and Economics*, 32 (1-2), 146-59.
- Bröchner, J. (2010) Construction contractors as service innovators. *Building Research and Information*, 38 (3), 235-46.
- Bunn, M.D. (1993) Taxonomy of buying decision approaches, *Journal of Marketing*, 57 (1), 38-56.
- Bygballe, L., Jahre, M. and Swärd, A. (2010) Partnering relationships in construction: a literature review, *Journal of Purchasing and Supply Management*, 16 (4), 239-53.
- Carr, A.S. and Smeltzer, L.R. (1997) An empirically based operational definition of strategic purchasing, *European Journal of Purchasing and Supply Management*, 3 (4), 199-207.
- Castaldi, C., ten Kate, C. and den Braber, R. (2011) Strategic purchasing and innovation: a relational view, *Technology Analysis and Strategic Management*, 23 (9), 983-1000.
- Chakrabarti, A.K. (1974) The role of champion in product innovation, *California Management Review*, 17 (2), 58-62.

- Comi, A., Bischof, M. and Eppler, J. (2014) Beyond projection: using collaborative visualizations to conduct qualitative interviews, *Qualitative Research in Organizations and Management: an International Journal*, 9 (2), 110-33.
- Cox, A. (2004) The art of the possible: relationship management in power regimes and supply chains. *Supply Chain Management: An International Journal*, 9 (5), 346-56.
- Dawes, P.L., Don, Y.L. and Dowling, G.R. (1998) Information Control and Influence in Emergent Buying Centres, *Journal of Marketing*, 62 (3), 55-68.
- Denzin, N.K., and Lincoln, Y.S. (Eds.). (2005) *The Sage handbook of qualitative research*, 3rd edn., Sage Publications, Thousand Oaks.
- Eisenhardt, K.M. (1989) Building theories from case study research, *Academic Management Review*, 14 (4), 532-50.
- Eisenhardt, K.M. and Graebner, M. (2007) Theory building from cases: opportunities and challenges. *Academy of Management Journal*, 50 (1), 25-32.
- Frödell, M., Josephson, P.-E., and Koch, C. (2013) Integration barriers for purchasing organization in a large construction company: towards requisite disintegration, *The IMP journal*, 7 (1), 46-58.
- Gadde, L-E. and Håkansson, H. (1993) *Professional purchasing*, Routledge, London.
- Gadde, L.-E. and Snehota, I. (2000) Making the most of supplier relationships. *Industrial Marketing Management*, 29 (4), 305–16.
- Gajendran, T., Brewer, G., Gudergan, S. and Sankaran, S. (2014) Deconstruction dynamic capabilities: the role of cognitive and organizational routines in the innovation process, *Construction Management and Economics*, 32 (3), 246-61.
- Gann, D.M. and Salter, A.J. (2000) Innovation in project-based, service-enhanced firms: the construction of complex products and systems, *Research Policy*, 29 (7), 955-72.

Hada, M., Grewal, R. and Lilien, G.L. (2013) Purchasing managers' perceived bias in supplier-selected referrals, *Journal of Supply Chain management*, 49 (4), 81-95.

Harris, F and McCaffer, R. (2013) *Modern Construction Management*, 7th edn., Wiley, Chichester.

Håkansson, H. and Johanson, J. (1992) A model of industrial networks, in Axelsson, B. and Easton, G. (eds) *Industrial networks: a new view of reality*, Routledge, London, 28-34.

Håkansson, H. and Ingemansson, M. (2013) Industrial renewal within the construction network, *Construction Management and Economics*, 31 (1), 40-61.

Karim, K., Marosszeky, M. and Davis, S. (2006) Managing subcontractor supply chain for quality in construction, *Engineering, Construction and Architectural Management*, 13 (1), 27-42.

Kohli, A.K. (1989) Determinants of influence in organizational buying: a contingency approach, *Journal of Marketing*, 53 (3), 50-65.

Kumaraswamy, M. and Matthews, J. (2000) Improved subcontractor selection employing partnering principles, *Journal of Management Engineering*, 16 (3), 47-57.

Leiringer, R. and Cardellino, P. (2008) Tales of the expected: investigating the rhetorical strategies of innovation champions, *Construction Management and Economics*, 26 (10), 1043-54.

Morgan, G. (1980) Paradigms, metaphors, and puzzle solving in organization theory. *Administrative science quarterly*, 25 (4), 605-22.

Murdoch, J. and Hughes, W. (2007) *Construction Contracts: Law and management*, 4th edn., Taylor and Francis, Abingdon.

Nam, C.H., and Tatum, C.B. (1997) Leaders and champions for construction innovation. *Construction Management and Economics*, 15 (4), 259-70.

OECD (2005) The measurement of scientific and technological activities, Oslo Manual. Guidelines for Collecting and Interpreting Innovation Data, 3rd edn., OECD EUROSTAT, Paris.

Olander, S. and Landin, A. (2005) Evaluation of stakeholder influence in the implementation of construction projects, *International Journal of Project Management*, 23 (4), 321-28.

Pettigrew, A.M. (1972) Information control as a power resource, *Sociology*, 6 (2), 187-204.

Pratt, M. (2009) For the lack of a boilerplate: tips on writing up (and reviewing) qualitative research. *Academy of Management journal*, 52 (5), 856-62.

Proverbs, D.G. and Holt, G.D. (2000) Reducing construction costs: European best practice supply chain implications. *European Journal of Purchasing and Supply Management*, 6 (3-4), 149-58.

Robinson, P.T., Faris, C.W. and Wind, Y. (1967) *Industrial Buying and Creative Marketing*, Allyn and Bacon, Boston.

Sheth, J.N. (1973) A model of industrial buying behavior, *Journal of Marketing*, 37 (4), 50-6.

Slaughter, S. (1998) Models of construction innovation, *Journal of Construction Engineering and Management*, 124 (3), 226-31.

Spekman, R.E. (1979) Influence and information: an exploratory investigation of the boundary role person's basis of power. *Academy of Management Journal*, 22 (1), 104-17.

Swift, C.O. (1995) Preferences for single sourcing and supplier selection criteria. *Journal of Business Research*, 32, 105-11.

Tatum, C.B. (1987) Process of innovation in construction firm. *Journal of Construction Engineering and Management*, 113 (4), 648-63.

Tushman, M.L. and Katz, R. (1980) External communication and project performance: an investigation into the role of gatekeepers, *Management Science*, 26 (11), 1071-85.

Van Weele, A.J. (2010) *Purchasing and supply chain management*, Cengage Learning, Andover.

Webster, F.E. and Wind, Y. (1972) *Organizational buying behavior*, Prentice Hall, Englewood Cliffs.

Whyte, J.K. (2003) Innovation and users: virtual reality in the construction sector, *Construction Management and Economics*, **21** (6), 565-72.

Widén K., Olander, S. and Atkin, B. (2014) Links between successful innovation diffusion and stakeholder engagement. *Journal of Management in Engineering*, 30 (5).

Yin, R.K. (2009) *Case study research: design and methods*. 4th edn., Sage Publications, Thousand Oaks.

APPENDIX

Table A1: Consolidation of the eight stages of the purchasing process (after Van Weele, 2010)

Identification of need	In this stage the client's needs are identified. This is typically done by a designer.
Establishing specification and scheduling the purchase	The specification is set for the project, a budget is made and purchases are scheduled. After this point changes might be difficult.
Identifying purchasing alternatives	The suppliers are identified based on suitability for the project and geographical proximity. Requests for quotations are sent out to suitable suppliers
Evaluating alternative purchasing actions	The alternative quotations are evaluated depending on a number of reasons such as previous experience, design and value for money.
Selecting the supplier	The most suitable candidate is chosen which may involve a confirmation from the client and designer as well as different levels in the purchasing organization.
Negotiation and contracting	A further negotiation of details is made and the contract is drawn up, usually from existing templates. In some cases, lawyers need to check the contract conditions and might suggest amendments.
Issuing the contract or order	The contract or order is formalized.
Following up to secure delivery	The delivery is received, verified at the site and documented.