

Work-in-Progress Paper

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Managing Perceived Risk for Better Performance in High Value, Low Volume Supply Networks:

A Case Study of Need Uncertainty from the UK Naval Shipbuilding Sector⁴

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Abstract

The aims of this paper are three-fold. Firstly, we present a brief review of the literature in order to identify some of the key variables that have been used to explain the levels of risk associated with given purchase situations. Secondly, we briefly discuss what the literature tells us about risk handling strategies, focusing in particular on the buying firm's likely response to different levels and types of perceived risk. Finally, we discuss a case study drawn from an on-going research project in the UK naval shipbuilding sector. The aim of this research project is to understand why a number of buying organizations are experiencing performance problems in particular supply networks, and to suggest strategies for improvement. Our interest in this paper is to explore what insights might be offered into this case study by the literature dealing with perceived risk.

Introduction

It is a common contention in the literature dealing with and buyer-seller interaction (Hakansson, Johanson and Wootz 1976; Turnbull, Ford and Cunningham 1996) that a desire to manage and/or reduce perceived risk is a critical driver of buyer and seller behaviour. Much the same conclusion has been reached in the literature dealing with organizational buying behaviour (Johnston and Lewin 1996; Peters and Venkatesan 1973). It is not surprising that buyers and sellers should be strongly motivated to manage the perceived risks associated with their interactions. There is substantial evidence that managers in a variety of corporate positions have a tendency to be risk averse (Arrow 1971; Swalm 1966) and several studies have shown that industrial buyers seek to minimize risk whenever possible (Sweeney, Mathews and Wilson 1973; Wilson 1971).

There is undoubtedly an individual psychological dimension to these findings, but there is also a strong economic/commercial argument in favour of greater certainty in the buyer-seller exchange environment. From the perspective of the buying organization there are costs associated with high levels of perceived risk in its dealings with particular suppliers. These costs

can be operational; if, for example, a supplier fails to deliver a crucial component on time or to the required quality and there are delays in the production process. They can be transactional; that is costs associated with monitoring supplier performance and enforcing contractual commitments under conditions of uncertainty. Finally, they can be reputational; that is when the failings of a supplier impact on the performance of the buying organization in the eyes of its customers. From the perspective of the seller, an ability to manage and/or reduce perceived risk by offering a reliable product or service is crucial in helping it to acquire and retain profitable customers.

The aims of this paper are three-fold. Firstly, we present a brief review of the literature in order to identify some of the key variables that have been used to explain the levels of risk associated with given purchase situations. Secondly, we briefly discuss what the literature tells us about risk handling strategies, focusing in particular on the buying firm's likely response to different levels and types of perceived risk. Finally, we discuss a case study drawn from an on-going research project in the UK naval shipbuilding sector. The aim of this research project is to understand why a number of buying organizations are experiencing performance problems in particular supply networks, and to suggest strategies for improvement. Our interest in this paper is to explore what insights might be offered into this case study by the literature dealing with perceived risk.

Literature Review

Most of the classic models of organizational buyer behaviour posit perceived risk as a core explanatory variable. One of the most influential and enduring of these models is the buy-grid classification developed by Robinson, Faris and Wind (1967). This model suggests a categorization with three basic purchase situations, each associated with a different level of uncertainty. These purchase situations are new task (high uncertainty), modified re-buy (medium

uncertainty) and straight re-buy (low uncertainty). The key differentiators between each situation are how much experience the buying organization has had in buying the same or a similar good or service, how much information is needed to make a decision, and the need to consider new or unknown suppliers.

This basic model of the newness or novelty of a purchase situation certainly offers a useful starting point for understanding perceived risk. As others have argued, however, the novelty dimension cannot give us a complete picture (Hutt and Speh 2001; Puto, Patton and King 1985). This is because the level of perceived risk in a purchase situation is a function of *both* the level of uncertainty and the potential consequences or impact of that uncertainty. For the level of perceived risk to be high, a purchasing decision needs to be characterized by significant uncertainty and the personal or organizational consequences of a poor decision need to be substantial.

All of this suggests that in order to understand perceived risk we need to factor in additional variables. Two variables that receive extensive discussion in the literature are the complexity of the purchase situation and the importance of the purchase (Johnston and Lewin 1996; McQuiston 1989). McQuiston (1989, p. 70) defines the complexity of the purchase situation in terms of how much detailed technical or specialist information is required to make an accurate evaluation of the product being bought. In general, studies dealing with the concept of complexity have concluded that an increase in the complexity of the purchase situation leads to greater uncertainty for the buying organization (cf. Kirsch and Kutschker 1982). Complexity and novelty are thus fairly closely related in that they both impact on the uncertainty dimension of perceived risk.

McQuiston (1989, p. 70) also provides a useful definition of the second additional variable that we should consider, the importance of the purchase. This is defined as the perceived impact of a purchase on *organizational* profitability and productivity. Based on this definition, we consider that perceived risk could only be high for those purchase situations in which a poor decision can substantially damage an organization's economic performance.

We turn now to a brief consideration of what the literature has to say about risk-handling strategies. One useful, albeit fairly general, contribution is the article by Puto, Patton and King (1985). They argue that the industrial buyer's supplier selection decision process is best characterized as one of problem solving in the face of probabilistic outcomes (risk). Given this, they suggest that industrial buyers have to adopt risk-handling strategies designed to reduce or at least manage these perceived risks. The article discusses three such strategies: reducing uncertainty by gathering additional information about a supplier and its offering; playing the odds by choosing the supplier with the most favourable expected value; and spreading the risk by selecting more than one supplier to service a particular requirement.

To gain a really effective insight into risk handling strategies, however, we must go beyond this fairly generalized level of discussion to consider how industrial buyers might behave in response to different *types* as well as different levels of risk. Hakansson, Johanson and Wootz (1976) make perhaps the most valuable contribution in this regard through the development of a three-fold typology of uncertainty. Considering the process of buyer-seller interaction from the buyer's point of view, they suggest that uncertainty can vary along three distinct although interrelated dimensions, which they dub need uncertainty, market uncertainty and transaction uncertainty.

Need uncertainty refers to the difficulties experienced by buying organizations in specifying precisely what it is that they require. This uncertainty encompasses not just the technical task of specifying the functional requirement of the buyer, but also other aspects of the buyer's demand such as quantities and the timing of precisely when an item is needed. Market uncertainty refers both to the level of heterogeneity in the supply market (differences between alternative suppliers) and to the level of dynamism (how far these differences change over time). This dimension of uncertainty can create difficulties for a buyer in accurately comparing the offering of one supplier with that of another. It also presents the possibility that a buyer might incur a substantial opportunity cost if it purchases from the same supplier over an extended period of time. Finally, transaction uncertainty refers to the physical, legal, or logistical difficulties that might be encountered in getting a product or service from the seller to the buyer. This type of uncertainty can also have a cultural or linguistic distance dimension.

The value of identifying these three dimensions of uncertainty is that it allows Hakansson, Johanson and Wootz (1976) to develop a more nuanced analysis of risk-handling strategies than that described above. According to their research findings, industrial buying behaviour does indeed vary in line with these different types of uncertainty. To take the example of purchase situations characterized by high need uncertainty, they argue that a common risk-handling strategy is for the buying organization to work closely with a known supplier.

In the next section, we present a brief overview of a case study from an on-going research project in the UK naval shipbuilding sector. Our discussion is framed in terms of the analytical categories of perceived risk and risk handling outlined above. Our intention is to see how far these categories of risk illuminate our case study findings.

Case Study: Buying Electrical Cables for Naval Shipbuilding Projects

The case study discussed here is drawn from a wider 18-month research project looking at particular supply networks feeding four companies from the UK shipbuilding and ship-repair sector. We have adopted an action-research methodology in carrying out these case studies (Greenwood and Levin 1998). The research team therefore consists of two academic researchers and nominated managers from each of the case study companies. Our aim is to go beyond a simple analysis and explanation of what is happening in particular supply networks, to engage the case study companies in a jointly managed process of performance improvement. Given limitations on space, only those discrete aspects of this case that are relevant to the issue of perceived risk are discussed here. A more complete discussion of the case can be found in Sanderson, Cox and Wright (2003).

The case in question concerns the supply network that delivers electrical cables to a major UK naval shipbuilder. We were asked by the shipbuilder to look at this particular supply network, because several of the suppliers within it have historically exhibited extremely poor performance. This is primarily in terms of the suppliers' inability to meet delivery targets and in terms of the very long lead times (typically in excess of 16 weeks) that the shipbuilder is forced to accept.

At a superficial level, one might assume that the perceived risk associated with buying electrical cables would be relatively low. The bought-in cost of electrical cables is only a very minor element of the overall cost of building a warship (typically less than 5%). This suggests that the importance of this purchase would be relatively low and that performance problems in the buying of this product would not be a particular priority. Moreover, the purchase situation for electrical cables within most shipbuilding projects is predominately straight re-buy with elements of modified re-buy. The design of each class of warship does vary significantly, but the

bulk of the electrical cable used on board each ship is selected from a well-established range of cable types, supplied by a relatively small number of known suppliers. In addition, with the exception of certain specialist cables, the pace of technological innovation in this product category is relatively low. In combination, these factors suggest that the levels of purchase novelty, purchase complexity and need, market and transaction uncertainty associated with electrical cables would also be relatively low.

Despite these purchase characteristics, however, our research in this case demonstrates that the perceived risk associated with buying electrical cables is in fact relatively high. Why should this be so? Contrary to an *a priori* assumption that cables are not an important purchase (based on the size of this category of expenditure), our findings reveal that the supplier performance problems exhibited in this supply network do have a substantial impact on the productivity and profitability of the shipbuilder. This conclusion is derived from the fact that electrical cables are present throughout every vessel. Consequently, delays in the delivery of a consignment of cable can and do cause severe and costly delays in the integration and outfitting phases of shipbuilding.

The remaining question is why should supplier performance be so poor, and perceived risk be so high, when electrical cables appear to be characterized by relatively low levels of purchase uncertainty? Our evidence demonstrates that the answer lies with the nature of the shipbuilding process itself. Given the time and complexity involved in designing and building a warship, and the infrequent nature of the work, concurrent engineering is the predominant method of working in this industry. This implies that the process of building a vessel begins while the design phase is still on going. Moreover, difficulties highlighted once building commences are fed back into the design process and incremental adjustments are made. Concurrent engineering therefore implies that both the design and the build schedule of a vessel are relatively unstable.

The relevance of this method of working to perceived risk in the buying of electrical cable is that it generates substantial need uncertainty. The demand profile for cable is closely linked to the overall design of a vessel and to the order in which elements of that vessel are integrated and outfitted. Given that these factors are relatively unstable, it is unsurprising that the shipbuilder in this case is experiencing significant need uncertainty in relation to cable types, quantities and the timing of deliveries. It is our contention that this need uncertainty is the primary cause of the poor supplier performance identified by the shipbuilder. In essence, suppliers are being prevented from achieving a reliable delivery performance, because the shipbuilder's demand signal is erratic and unpredictable. Shorter lead times are also difficult to achieve in an environment where suppliers find it virtually impossible to undertake longer-term planning of their own procurement and production schedules.

Our conclusion based on this analysis is that the perceived risk associated with buying electrical cables can only be reduced, and supplier performance improved, if the shipbuilder reviews its approach to the design and build process. We argue that this review should focus on three main issues. Firstly, the design of a vessel should be more mature before building begins. Secondly, design changes should be minimized once building is underway. Thirdly, where such changes are imperative they should be centrally approved and coordinated. This case therefore poses a challenge to the contention of Hakansson, Johanson and Wootz (1976) that a buying organization can best mitigate need uncertainty by working more closely with a known supplier. Such close working may make a supplier more willing to accommodate the need uncertainty of the shipbuilder, but in this case the solution, like the problem, lies within the buying organization.

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