

Assessing the adoption of business-to-business E-commerce: a judgemental modelling approach

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ABSTRACT

Appropriate deployment of web-enabled technologies is recognised as one of the main challenges facing firms, especially within the business-to-business environment. This paper shows how judgemental modelling can help to assess facets of a firm's existing buyer-supplier relationships and the potential effects of adopting e-commerce within a firm's supply chain. The research is based on a case study of a small-medium sized privately owned multinational in a specialist segment of the food and drink packaging industry. Judgemental modelling is used to analyse data collected through interviews with the firm's customers, suppliers and employees and is supplemented by correspondence analysis. The results show the perceived impact of adopting e-commerce on buyer-supplier relationships and identify strategic aspects within the firm's value chain that can be advantageously developed. Perspectives on the importance of different attributes of the buyer-supplier relationship and the potential effects of e-commerce differ amongst players within the network, highlighting the need for careful planning when designing and introducing an electronic trading platform.

INTRODUCTION

Applications of electronic commerce (or e-commerce), which involves the automation of commercial transactions using computer and communications technologies, began in the early 1970's with innovations such as the electronic transfer of funds. The introduction of electronic data interchange (EDI) expanded the scope of e-commerce from financial institutions to manufacturers, retailers and others in the service sector, but was generally limited to large corporations. Barriers to its widespread acceptance and usage were due to cost, demanding technical requirements (with specific data formats such as EDIFACT or X12), and the control exercised by individual providers over the value-added networks on which it is based (Angeles, 2000).

Since the commercialisation of the internet and the introduction of the web in the early 1990's, the number and variety of applications has expanded rapidly (Timmers, 1999). The widespread accessibility and interconnectivity of the internet, as well as the relatively inexpensive infrastructure it provides for data transmission, mean that the possibility of adopting e-commerce is now within the reach of smaller firms. It has the potential to include all areas of traditional business, such as administration, sales,

service and support, as well as allowing the development of more innovative business approaches. Electronic systems deployed within a single firm have often been found relatively easy to imitate and have generally only provided transient advantages to the adopter. In contrast, systems that create linkages outside the organisation with buyers and suppliers can have sustained effects on the firm's competitiveness (Westland and Clark, 1999). An appropriate deployment of web enabled technologies, especially within the business-to-business (B2B) environment, is generally recognised as one of the major opportunities and challenges which organisations will face in future years (Fraser, Fraser and McDonald, 2000).

The adoption of e-commerce in buyer-supplier relationships may bring considerable long term benefits, but there are also significant risks, so the design and introduction of such systems needs careful planning. As in other areas of information technology, implementation has often been dominated by a heavy focus on the technological side, with relatively little attention to the softer aspects such as the user's perception of the new systems. Yet the adoption of an electronic trading platform is likely to have a pervasive influence on the relationships between buyers and suppliers and user resistance is now seen as the main reason for the failure of so many electronic systems development and implementation projects.

This paper examines the potential for using judgemental modelling to evaluate the likely effects of adopting e-commerce within a firm's supply chain as an aid to designing an appropriate e-commerce strategy. The research is based on a case study of a privately owned multinational (renamed Pako) that operates in a specialist segment of the food and drink packaging industry. It focuses on the assessment of the attributes of the firm's existing buyer-supplier relationships and ways in which the introduction of e-commerce is likely to affect these, rather than on the technological considerations raised by the adoption of the new technologies. The findings are based on the perspectives of the different potential users in the network, using data collected by interviewing a sample of the firm's employees, suppliers and customers.

The next section provides the context of the study by reference to the literature on buyer-supplier relationships and the background to the empirical research. A description of the data and methodology follows, including a discussion of the judgemental modelling technique used. The results are then presented and the strategic implications of the findings for management are discussed.

THE CONTEXT: BUYER-SUPPLIER RELATIONSHIPS

Until recently, EDI has predominantly been conducted between partners in existing relationships using proprietary software and VAN's. While there is evidence about both the benefits and shortcomings of this approach (Naudé et al., 2000), there is relatively little evidence other than that provided by individual cases. Rapid development in the use of the Internet for conducting buyer-supplier relationships is predicted over the next few years. Forrester Research (2001), for example, forecasts that the proportion of goods and services sold in the US through B2B e-commerce will rise to 27% by 2006, with the main increases occurring from 2003 and suggests that this will lead to considerable increases in productivity.

There is, conversely, a large body of research on buyer-supplier relationships. This highlights different approaches to supply chain management and its widening focus beyond the traditional concerns with cost/price and delivery times to include other facets which may play an important part in building effective trading networks. Two contrasting approaches to managing buyer-supplier relationships are defined in the literature, namely adversarial and partnership. On the one hand, the adversarial approach is characterised as being at arm's length, where either the supplier or the buyer "wins". The partnership approach, on the other, depends on the development over time of strong bonds based on trust with the aim of securing a "win" for both supplier and buyer (Tucker and Jones, 2000; Ford et al., 2002).

The adversarial approach to the buyer-supplier relationship reflects the pre-1980's view of the purchasing function as non-strategic and mainly carried out as a buying activity at an operational and clerical level (Harland et al., 1999). Price was the dominant driver of this activity and the wider context of the business was not considered. More recent moves towards partnership approaches have been driven by the need for both buyers and suppliers to remain competitive (Lamming, 1993). Shorter product life cycles, global competition, pressure from shareholders for profit and increased business complexity, among other factors, have encouraged supplier base reduction and relationship management (Holmlund and Kock, 1996). Alongside these changes, the importance of non-price factors in purchasing and supply decisions is increasingly recognised.

A partnership approach will not be appropriate in every situation, and the buy class framework developed by Robinson et al. (1967) still helps to determine the type of buyer-supplier relationship that is likely to be most suitable. The strategic significance of the item being purchased (straight rebuy, modified rebuy or new task) influences the nature of the relationship, as well as the original make vs. buy decision. Hence frequent purchases at the centre of a firm's operations may call for a partnership approach, whereas single purchases of low value items in plentiful supply may be viewed as an adversarial opportunity (Iyer, 1996).

Trust is important in both adversarial and partnership buyer-supplier relationships, although the nature of trust differs in the two approaches (Cannon and Perreault, 1999). The significance of trust in relationships has been explored by Sako (1992), who categorised trust into three distinct types. These are contractual trust, where both buyer and supplier fulfil their contractual obligations; competence trust, where both parties act competently within the relationship, and goodwill trust, where there is a tendency to exceed what is required in the formal contract and a willingness to share information. Adversarial relationships involve contractual and competence trust, whereas goodwill trust is more likely to develop in the partnership approach (Tucker and Jones, 2000). The use of e-commerce in supplier-buyer relationships raises a further issue concerning trust, namely the trust in the transaction medium, which is related to data privacy and integrity. This is an on-going problem that is currently being addressed by digital signatures and data encryption, but is left aside in this discussion (Tucker and Jones, 2000).

An appreciation of the role of non-price factors in the purchasing and supply decision, and the nature of the buyer-supplier relationship, together with the possible effects of the introduction of e-commerce on these, is important for individual firms seeking to adopt e-commerce. Early EDI was typically used by large automotive firms to gain competitive advantage by making the use of their individual systems a prerequisite for continuing business, so locking-in suppliers and customers and locking out competitors (Min and Galle, 1999; Ratnasingham, 2000). Internet e-commerce has lower entry barriers than traditional EDI, and the application of open networks and standards brings lower switching costs, so the traditional "lock-in" of the proprietary EDI link is less likely to occur (Graham and Hardaker, 2000). Integration of business processes may be simplified, resulting in improved information flows across the supply chain.

It has been suggested that e-commerce may lead to more adversarial relationships, as the use of electronic intelligent search agents and reverse auctions give organisations a greater choice of supplier (Emiliani and Stec, 2002; Spekman et al., 2002). In addition, there may be less chance for relationships which began as adversarial, to mature into partnerships because of the lack of frequent face-to-face communication in the development stage of the relationship. For firms already within well developed buyer-supplier networks characterised by goodwill trust and subjective loyalty, this tendency towards more adversarial relationships may be offset, however, by managers continuing to deal with suppliers they have dealt with successfully in the past. In this situation, buyers and suppliers are already selectively committed to doing business with each other. Indeed, the introduction of e-commerce may lead to a new form of "lock-in" as greater integration of business processes increases the need for shared information and resources (Tucker and Jones, 2000).

The industrial context of the study and problem definition

The segment of the global food and drink packaging industry in which Pako operates is tightly oligopolistic. It is dominated by one very large firm and Pako is a much smaller niche player. There is growing competition from substitute products, adding to the competitive pressures faced by the firm. The supply of the main raw material is also highly concentrated with only three main suppliers, of which one is extremely dominant, mirroring the structure of the industry in which Pako operates. There are three other raw materials with limited supply possibilities that Pako outsources from different countries. The limited number of suppliers is matched by the small number of potential customers, with Pako's sales mainly accounted for by one type of packaging user both in its home country and abroad.

The existence of only a relatively small set of buyers and suppliers and the need for frequent purchases of items that are strategically important to Pako has resulted in well-developed personal relationships with other players in the supply network. With the product having all the features of a straight rebuy, the management of Pako believes that relationships based upon goodwill trust serve it best, tempered by the financial power of their large buyers and suppliers. Pako's management regarded the established relationships with both buyers and suppliers as a very important aspect of competitiveness and was understandably apprehensive about how these might be affected by the adoption of new e-commerce technologies. The intense rivalry Pako

faced in its own industry, together with the strength of its main customers and suppliers, meant that the perceived risks of adopting the new e-commerce technology were regarded as very high.

Pako had pursued an explicit IT strategy since the mid 1990's and was at a stage that can best be described as "internal integration" (Scott Morton, 1991), as its use of the new technologies to date had required only incremental changes in organisational structure. The adoption of e-commerce would be a more revolutionary step. As a result, the firm was open to research which could develop an understanding of the perception that both buyers and suppliers had of the potential benefits of e-commerce and the effect this might have on their future business with Pako. Judgemental modelling is still a relatively underutilised tool in this research setting and is proposed here as a way of overcoming some of the difficulties inherent in assessing relationships (Blois, 2002). In this case, the firm provided a suitable research site to assess the usefulness of the approach in testing the relative importance of the different facets of the existing buyer-supplier relationship and in helping to determine an appropriate e-commerce strategy. The methodology and its application in Pako's case are described in more detail in the next section.

METHODOLOGY

Comparative studies of attributes, their importance and the relative performance of competing approaches, commonly lack substantive measures of the extent to which factors differ from one another. Judgemental modelling (Islei and Lockett, 1988; Saaty, 1980) offers a way to overcome this problem. It is based on an underlying compensatory model (see Wind, 1982; Hipkin and Naudé, 1999) which decomposes a problem into three separate hierarchical issues:

1. what attributes are important to users in assessing relationships?
2. how do these attributes vary in importance? and
3. how do the alternatives (in this case traditional interaction vs. e-commerce based interaction) perform relative to one another on this same attribute set?

The construction of the decision hierarchy used in data collection is critical when applying judgemental modelling. The upper-most level of the hierarchy contains the decision objective, which is subsequently broken down into lower levels of more detailed attributes and components (Zahedi, 1997). The decision hierarchy constructed

for this study was adapted from one developed by Hipkin and Naudé (1999). The decision to adapt this decision hierarchy was taken after reviewing the relevant buyer-supplier relationship literature (Naudé and Buttle, 2000), from which it was felt that the important elements of these relationships were captured by the model.

The hierarchy used in this study had to be general enough to facilitate its usage to explore both the supply and buying sides, and hence could not be tailored to suit one particular relationship. The final set of relationship attributes was agreed with Pako management (Table 1). There were 24 second-level attributes, which in turn were amalgamated into 6 first-level attributes, namely delivery, financial terms, image, interrelationships, product, and service performance. This attribute set was similar to those used in earlier studies (Hipkin and Naudé, 1999) and is well grounded in broader decision attributes used by managers (see Nilsson and Host, 1987).

The structure for the quantitative data collection was provided by the PC-based JAS programme developed by Islei and Lockett (see Islei and Lockett, 1988; Lockett and Islei, 1993). As with Saaty's analytical hierarchy process (AHP), the methodology uses pairwise comparison of the attributes to determine their relative weightings, and this permits some measure of the consistency of the respondents' answers. The use of pairwise comparison methods rather than direct ratings is considered more suitable for collecting quantitative data, particularly where the attributes are intangible or subjective in nature (Naudé et al., 1993a).

The data was collected through face-to-face interviews so that the nature of the research could be fully explained to the respondents and any concepts with which they were unfamiliar clarified. The attribute scorings were used as the basis of a wider discussion of buyer-supplier relationships and likely effects of e-commerce that aided our qualitative understanding of the broader decision environment.

Table 1. Description of the first and second level attributes used

Attributes	Description
Delivery	
d1 Reliability	Offering products on time, making and keeping the agreement
d2 Production process	Degree of impact of the company's processes on our business
d3 Information	Clarity and correctness of information and documentation
d4 Lead times	Time elapsed between making and receiving orders
d5 Delivery quality	The extent to which orders are delivered on time and in full
Financial terms	
f1 Value	The extent to which price and quality combine to give value
f2 Payment	Extent of the company's flexibility in payment terms
f3 Prompt quotes	The extent to which quotations are given on time
f4 Flexibility	The extent to which price negotiations are flexible
Image	
i1 Strategy	Vision and coherence of the company's strategy
i2 Customer focus	The extent to which the company puts the customer first
i3 Reputation	Covers both innovation and being a caring company
i4 Market position	The extent to which they are globalised and committed to the future
Interrelationships	
r1 Ease of contact	Supply of information and support for problem solving
r2 Access	Ease of contact with other functions within the company
r3 Information	Information flow about potential problems and market trends
r4 Company representative	Knowledge and professionalism
Product	
p1 Stable range	The extent to which the product range is stable over time
p2 Quality levels	Absolute quality of the product
p3 Consistent quality	Consistent quality and consistent specification
p4 New product development (NPD)	Extent of NPD and willingness to work with customers
Service performance	
s1 Technical issues	Covers both rapidity and effectiveness of service
s2 Literature	Quality of technical literature
s3 Facilities	The extent to which the company's facilities are available for our use

It was important for the subsequent comparisons that all of the respondents used the same attribute hierarchy, although the context of the discussion varied. This was because four different types of network actors were interviewed (Pako's customers and Pako employees involved in selling, and Pako's suppliers and its purchasing employees) to ensure all the key contact points in the firm's buyer-supplier network were represented.

JAS and AHP methods have their critics. Taylor et al. (1998) and Min (1994) point out that risk and uncertainty are not considered, as the relative importance of each attribute is assumed to be known with certainty. Additionally, the use of pairwise comparisons is reliant on subjective judgements and hence the results can be affected by the choice of person being interviewed (Naudé et al. 1993b). These criticisms are well founded, and emphasise the need for the careful selection of interviewees.

The sample included key actors in the firm's buyer-supplier network and was drawn judgements after discussion with Pako managers. The chosen interviewees were contacted by Pako managers to request their cooperation with the study. This personal approach, together with the perceived relevance of the topic, ensured a high response. A total of twenty semi-structured interviews were conducted over a three month period. The respondents included four Pako employees with key roles in purchasing (Respondents 1, 2, 3 and 4) and two Pako employees on the marketing side (Respondents 5 and 6). Fourteen of the respondents represented major points of contact outside the firm and, between them, were located in nine different countries. This was regarded as giving a sufficient number and spread in view of the concentrated nature of the main supplier and customer markets and the firm's relatively small customer and supply base. The interviewees included eleven customers, of whom eight represented the major user industry for Pako's products (Respondents 9, 10, 11, 12, 13, 16 and 17), two represented the second most important (Respondent 7 and 14) with two other users represented by one interviewee each (Respondents 8 and 15). Three suppliers were included (Respondents 18, 19 and 20), of whom the first two represented major suppliers of the main raw material. Each was sent an explanation of the purpose of the study, a copy of the attribute descriptions and the schematic of the decision hierarchy prior to the interview.

RESULTS

Attribute importance

The averages and rankings on the first level attributes for each of the four different groups of respondents identified above are shown in Table 2.

Table 2. Average ranking scores of first level attributes

		Average weights assigned by respondents					
		Delivery	Financial	Image	Interrelationships	Product	Service
Pako as purchaser	Mean	20.7	20.1	7.1	11.3	28.3	12.7
	Rank	2	3	6	5	1	4
Pako as supplier	Mean	19.8	12.1	7.6	18.1	26.6	16.1
	Rank	2	5	6	3	1	4
Buyers	Mean	21.2	19.3	6.2	10.4	26.6	16.3
	Rank	2	3	6	5	1	4
Suppliers	Mean	19.3	15.1	8.1	11.6	31.6	14.3
	Rank	2	3	6	5	1	4
Overall	Mean	20.7	18.1	6.8	11.5	27.7	15.2
	Rank	2	3	6	5	1	4

The numbers are essentially utility scorings, allocating 100 points among the various attributes. The consistency of the respondents' view of the importance of the attributes is assessed by comparing the overall average to the averages relating to the four interviewee groups.

All four respondent groups perceived product attributes as being the most important issue; a shortcoming in either the actual product contained within the packaging or the packaging surrounding was of major consequence. With some minor variations, delivery and financial issues were seen as being next in importance, with interrelationships and image being the least important. The only difference of any note is that Pako employees as a supplier group ranked interrelationships above financial terms. The interviewees all ranked image in last place, which reflects its lack of importance in established buyer-supplier relationships. The majority of interviewees commented that image would be ranked higher if the context was one of searching for a new supplier. This finding echoes that of earlier studies in the European chemical industry (Hipkin and Naudé, 1999).

Of particular interest here was the relative lack of importance of the interrelationship attribute to all respondents. Pako managers had expected this to be higher, and

commented that it was probably the firm's relatively small size compared with its main buyers and suppliers (and hence lack of power) that influenced the scores.

The overall average ranking is important, as this gives a general view of which areas of the existing buyer-supplier relationship were considered most important. As shown in Table 2, four attributes, namely product, delivery, financial terms and service performance, are clearly the most important.

This reflects the interviewees' general stress on the importance of obtaining the right product, in the right place, at the right price and with the necessary service to back it up. Doney and Cannon (1997) similarly found delivery and financial aspects to be key criteria in buyer-supplier relationships. The overall average importance of the product attribute may be because the purchases being discussed were generally considered to be at the centre of the firm's operations (Iyer, 1996).

As always, there is the danger that averages may hide more than they reveal. Are the respondents within each of the four groups represented in Table 2 similar in their appraisal of the attributes? On closer examination, only four of the respondents exactly matched the overall average. In order to gain more insights into how the respondents' perceptions varied, the second level attribute scores for each respondent were analysed using correspondence analysis, a perceptual mapping procedure used extensively in marketing applications. The resulting maps show the relative position of both the respondents and the attributes in two (unnamed) dimensions (Hoffman and Franke, 1986; Greenacre and Hastie, 1987). Two aspects of the interpretation of these maps are worth mentioning. First, the plots for respondents (or attributes) that are in some average sense 'similar' across the different attributes (or respondents) will appear close together. Second, those respondents (or attributes) that have average scores across the different attributes (or respondents) will appear close to the intersection of the axes.

The results of applying correspondence analysis are illustrated in Figure 1, which gives some indication of the level of variance in the dataset. Two aspects are of interest in this diagram. First, the extent to which the various second level attributes are spread rather than grouped closely together – indeed, it is only the financial attributes (f1-f4) that all fall within the same quadrant. Second, it is clear that there is no one view as to what is important across the attributes, with the different respondents being associated with different attributes.

Figure 1. The Respondents and their Assessment of the Second Level Attributes

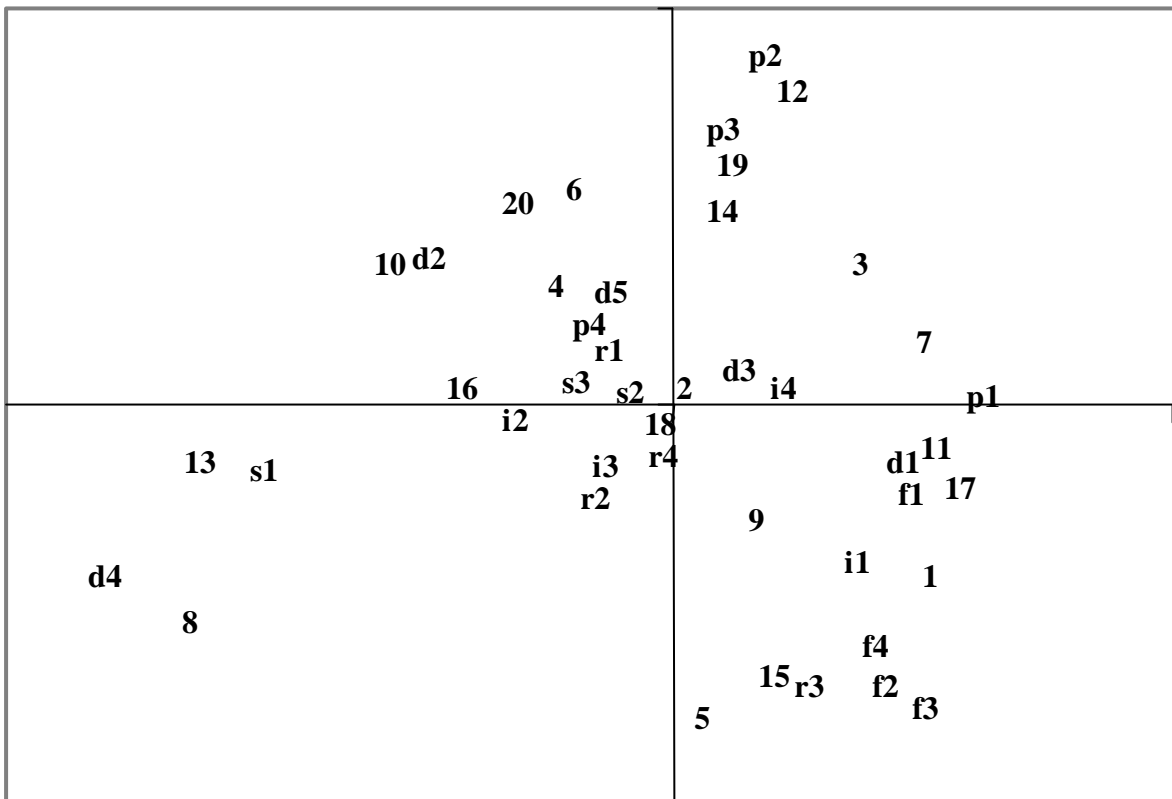


Figure 1 shows how the different respondents group according to the second level attributes. Although fairly diverse, the figure shows two main clusters: a ‘product’ group consisting of Respondents 3, 6, 7, 12, 14, 19 and 20; and a ‘financial’ group consisting of Respondents 1, 5, 9, 11, 15, and 17. These two groups can possibly be subdivided into two smaller groups that reflect more specific trends; e.g., ‘product/service’. In addition, there are four outlying interviewees, namely 8, 10, 13 and 16, who view varying issues surrounding lead times (d4), production (d2), and technical service (s1) as being the dominant attributes.

The combination of the JAS-based approach with semi-structured interviews allowed some insights into the reasons behind this variance. For example, the response of Respondent 8, a plant manager buying Pako's packaging, reflects her focus on just-in-time delivery and keeping the operation running, while her low score for product related issues is due to her organisation's lack of requirement for new products. In the case of Respondent 10, the owner of a small plant with one packaging machine from Pako, the

high ranking of service performance reflected their lack of resources in the area of technical service.

As product was the most important first level attribute, attention will be confined to examining the product sub-attributes instead of presenting all the results of the second level attributes. The average scores for these are shown in Table 3.

Table 3. Average ranking scores of product second level attributes

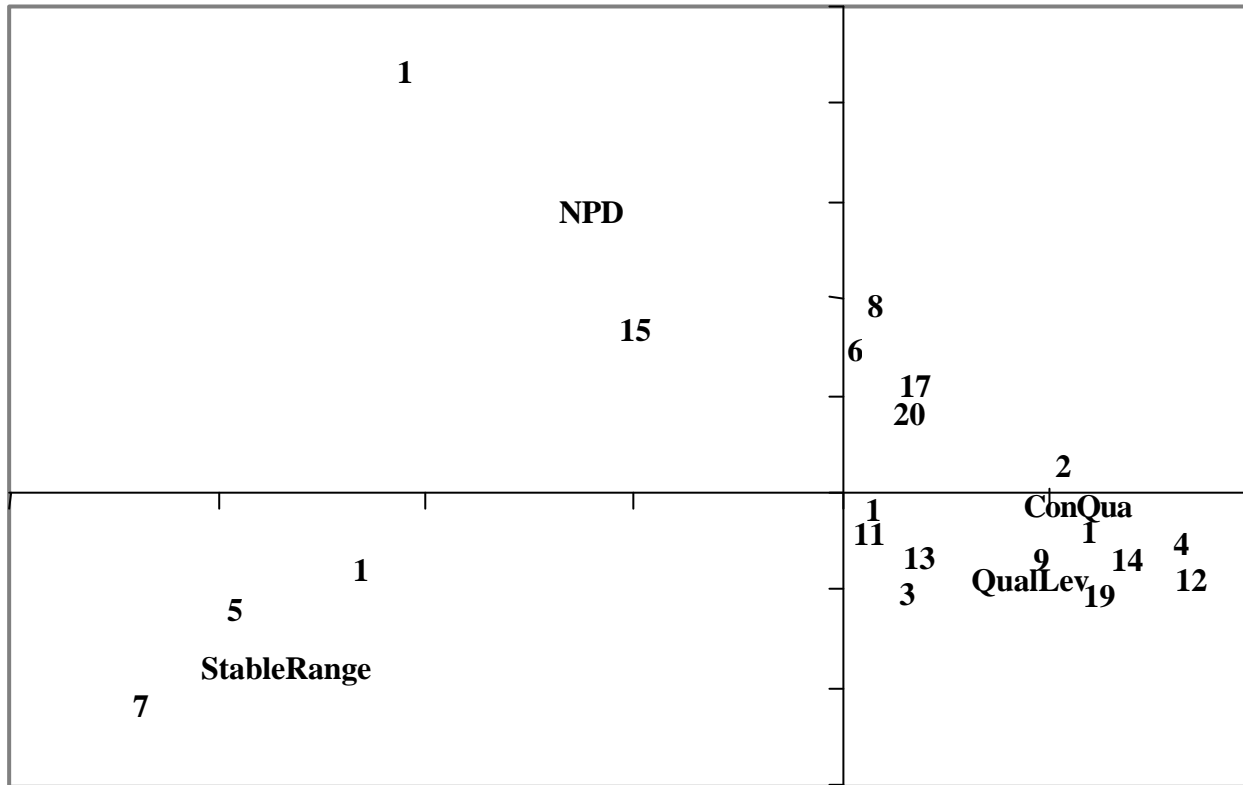
		Average of ranking weights assigned by respondents			
		Range stability (p1)	Quality levels (p2)	Consistent quality (p3)	New product development (p4)
Pako as buyer	Average Ranking	16.3 3	20.9 2	49.7 1	13.1 4
Pako as supplier	Average Ranking	23.4 2	15.4 4	39.3 1	22.0 3
Buyers	Average Ranking	13.4 4	26.8 2	39.8 1	20.0 3
Suppliers	Average Ranking	11.7 4	29.5 2	44.0 1	14.8 3
Overall	Average Ranking	14.7 4	24.9 2	42.4 1	18.0 3

The overall average indicates that ‘consistent quality’ of the product was considered by all groups to be the most important attribute. Interestingly, it is the Pako suppliers and buyers that deviate most from the overall average, and most notably ‘range stability’ is rated above ‘new product development’ in both cases, in contrast to their counterparts in the network.

Consistent quality and quality level are the more important of the second level attributes. This was confirmed by the majority of interviewees who considered consistent quality to have a direct influence on the efficiency of their own manufacturing processes. New product development was generally viewed as preferable to a stable range, reflecting the demand for new products in the customers' main markets that leads to a requirement for innovative new packaging designs. This illustrates the effect that shorter product life cycles and global competition can have on demands in the buyer-supplier relationship (Homlund and Kock, 1996).

As expected, individual interviewees again deviated significantly from the overall average results in some instances, as illustrated by the results of correspondence analysis shown in Figure 2.

Figure 2. The Respondents and their Assessment of the Product Attributes



The plot indicates that respondents can be clustered into a group seeking consistent quality/quality levels (Respondents 2, 3, 4, 9, 10, 12, 13, 14 and 19), and those seeking to trade off some of this importance in favour of new product development (Respondents 6, 8, 15, 16, 17 and 20). Again there are interviewees who lie outside these two groups (Respondents 1, 5, and 7) who favoured a stable range. Two respondents, namely 11 and 18, ranked the attributes in such a manner that their results are difficult to determine from the plot. This is because they gave several of the attributes similar weightings, thereby not discriminating between them.

Assessment of the effects of e-commerce

The assessment of the relative advantages of adopting e-commerce was based on evaluating just two criteria, the traditional and e-commerce routes, and consequently only the results for e-commerce are reported, as the results for traditional channels are simply the reciprocal values. The results are displayed as individual respondent and overall average values which indicate that e-commerce will have a positive effect on the attribute when the score is greater than 50, and a negative effect when the score is less than 50. The combined weighted scores of the perceived performance of e-commerce on the various first level attributes are shown in Table 4.

Table 4. Perceived overall effect of e-commerce on first level attributes

Respondent No.	Average perceived effect of e-commerce compared to traditional methods. Values greater than 50 increased, less than 50 decreased					
	Delivery	Financial	Image	Interrelationships	Product	Service
1	66.2	73.0	55.3	73.9	38.3	53.3
2	65.9	73.0	58.4	59.0	52.9	51.4
3	68.1	55.1	67.4	78.7	50.0	77.0
4	75.6	67.3	42.5	64.2	50.0	72.5
5	63.9	68.7	78.3	83.6	49.9	70.2
6	77.3	58.8	65.9	55.3	54.1	60.5
7	68.3	61.0	59.8	80.7	54.1	57.7
8	80.0	56.8	55.0	72.8	55.6	66.4
9	57.3	52.2	77.0	65.4	52.6	65.6
10	63.0	54.1	60.6	77.7	51.2	52.7
11	64.1	67.5	64.8	78.5	55.3	65.1
12	79.7	65.7	46.8	76.3	68.2	71.3
13	75.7	55.3	70.7	61.4	63.5	68.4
14	59.3	57.6	68.1	64.9	50.6	63.0
15	61.9	72.2	82.1	66.0	58.9	50.9
16	68.4	60.4	69.6	75.1	70.3	74.1
17	63.4	51.8	84.5	70.2	70.1	88.5
18	79.8	60.0	69.7	72.5	52.8	64.5
19	83.4	66.1	77.9	86.9	65.0	75.7
20	57.3	50.0	77.3	63.2	50.0	66.3
Average	68.9	61.3	66.65	71.3	55.7	65.8
Ranking	2	5	3	1	6	4

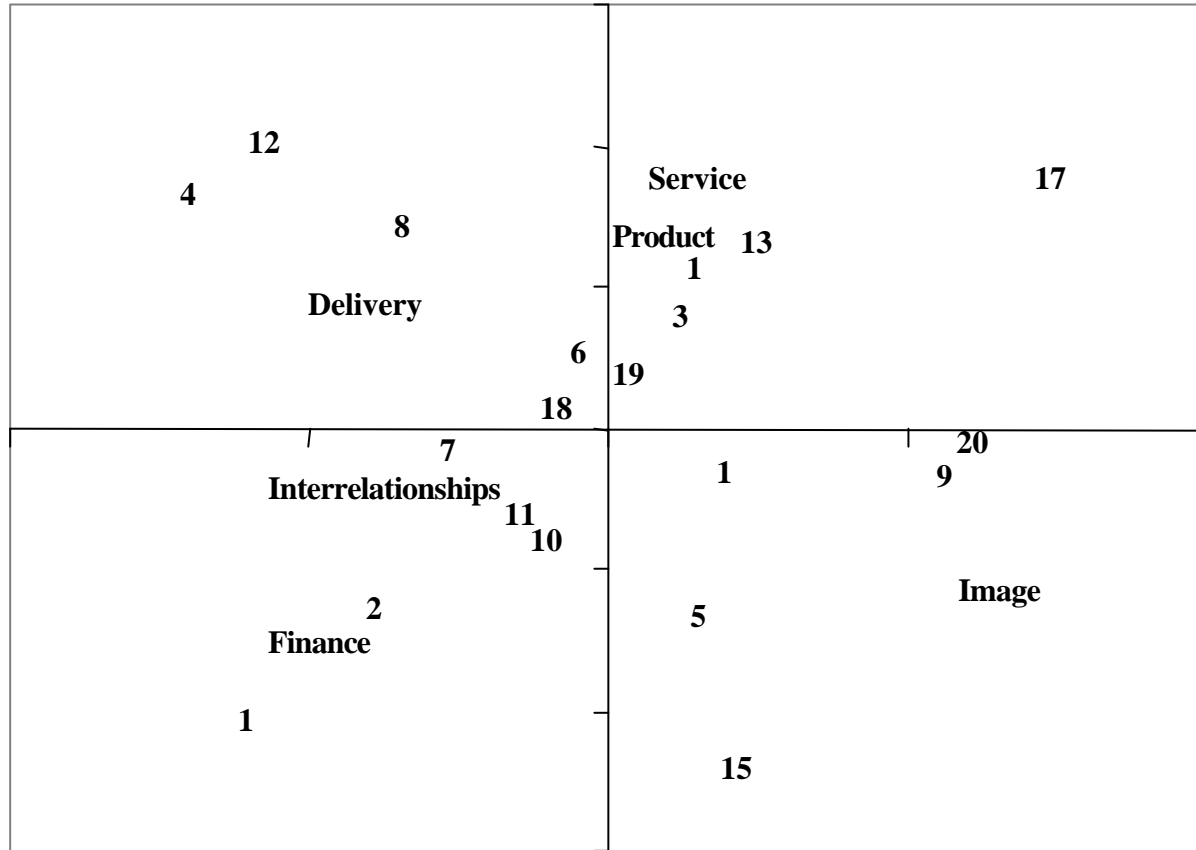
In general, the interviewees felt that e-commerce will have a positive affect on all the first level attributes and there were only three respondents signalling a negative effect, each time on just one of the attributes. E-commerce was perceived to have most potential for enhancing interrelationships, followed by benefits expected for delivery and image. However, of most obvious concern to Pako managers was the fact that interrelationships and image were seen as being the two least important attributes. Interrelationships between firms can naturally evolve as more business is done via e-commerce. Dell computers have already exploited this with the creation of premier pages for developing linkages with their largest customers (Magretta, 1998). Respondent 19 indicated that this was their strategy, and they had created an extranet-based shared service centre to handle ordering and invoicing and would then move on to service aspects later. Delivery (an important attribute) may have featured as an aspect

where there would be important benefits as the interviewees had the most experience with the use of e-commerce in this area - many of Pako's customers were already using EDI for receiving orders from their retail customers downstream. E-commerce can be used to bring customers to the firm's web site to order products, and the service attribute would be easier to develop if the customers already had an electronic relationship with the firm.

It is evident from the interviews that the introduction of e-commerce was felt to enhance the image of smaller multinational companies like Pako, although effort would be needed to mould the image into one desired by the company. Once again, however, there was no consensus among the respondents concerning the potential benefits of e-commerce. Although it was seen to have most potential in assisting relationship development, Figure 3 shows the extent to which the respondents varied in their perspective. There were those who saw its greatest potential in delivery (Respondents 4, 8, 12); finance (Respondents 1 and 2 certainly, 7, 10, and 11 to a lesser extent); image (Respondents 5, 9, 14, 15, and 20), and product/service (Respondents 3, 9, 13, 16, 17, 20).

The interviewees all regarded e-commerce as a business progression with which they would have to become involved. This may partly reflect the media attention that e-commerce is receiving, particularly within the B2B environment, and the effort that large firms downstream of this industry are devoting to developing standards for electronic trading. This apparent inevitability of e-commerce was summed up by Interviewee 12, one of Pako's customers, who in the year prior to the interview, thought he would retire within five years and so did not have to worry about Internet based e-commerce. It became evident, however, that he would be doing business by e-commerce much sooner than he originally expected and he had since been on Internet and e-commerce courses.

Figure 3. The Respondents and their Assessment of the Benefits of E-Commerce



The development of e-commerce in the firm's customer industries is clearly being driven by the big players downstream in food and drink retailing, who are pushing for global standards for e-commerce to allow for seamless communication in the supply chain for improved forecasting and distribution (Goodwin, 1999).

The effect of e-commerce on the various second-level attributes is not discussed in detail here. The attributes that interviewees considered would be most affected by e-commerce were those in the delivery category related to information gathering (an average score of 80%) and lead times (73%). The interviewees believed that the information aspect of delivery would be strongly affected, expecting it would be more accurate, continuously updated and more accessible, providing on-line tracking of orders. Lead times were also expected to be reduced by less re-keying of data due to ordering via the Internet or direct connections between company's IT systems. This impact on information provision has important implications for Pako. Its existing systems of information distribution appeared to be a weak point; for example, the majority of Pako customers interviewed were not aware of the facilities that Pako already had available for customer use. Some of this information is given on the firm's web site, but it was evident that these customers had never visited it.

CONCLUSION

There has been a considerable emphasis in the past on the purely technological aspects of decisions concerning the adoption of new technologies. However, user perceptions and requirements play a key role in determining the success or failure of a new technology and the importance of taking these into account is increasingly recognised. As Ford et al (1998) stressed, *'Even though a technology may be encapsulated in a clear physical presence..., its economic potential is always determined by how it is related to other technologies with which it is used, the requirements of those involved and the situations in which they find themselves'*.

The introduction of B2B e-commerce is likely to have a variety of effects on buyer-supplier relationships which need assessment within the individual context to reach appropriate decisions about adoption, design and implementation of such a system. There is much compelling evidence about the failed implementation of expensive IT systems (Petroni, 2002; Delfmann, 2002). This paper examines judgemental modelling

as a way of taking advantage of interactions with other actors in the network in the process of investment choice as a way of understanding the issues more fully. It shows that this technique, alongside other approaches, can help firms to focus on the important business attributes in its buyer-supplier relationships that may be affected by the investment. It also allows the results of a systematic analysis of the perceptions of different types of actors embedded in the process to be fed into actual decision making.

The research was based on the evidence gathered from key personnel within the buyer-supplier network of a single firm, a niche player in an oligopolistic segment of the food and drink packaging industry, which was considering the adoption of e-commerce. The JAS software allowed data concerning the perceived importance of the various attributes of the buyer-supplier relationship and the likely impact of e-commerce to be collected in an interactive manner in face-to-face interviews with key personnel in the firm's buyer-supplier network. The wider discussion prompted by the interviewee's scoring of the attributes resulted in the collection of a rich qualitative data set which allowed the individual quantitative responses to be placed in context.

The judgemental modelling approach can be combined with other statistical approaches to develop an understanding of the extent to which the averages hide variance within the data. In this case, correspondence analysis was used to reveal the similarities and differences in the interviewees' perspectives of the importance of selected attributes in the buyer-supplier relationship and the likely impact of adopting e-commerce. Although the adoption of e-commerce was expected to have a positive impact, views on its effects on different attributes varied substantially. This suggested that a cautious approach should be adopted to the introduction of an electronic trading platform and highlighted the need for adapted offerings to be designed for the firm's various industrial counterparts rather than introducing e-commerce in one specific and predefined way. The normative approach in some of the relationship management literature, suggesting that a particular format of relationship management is in a company's best interests, is not supported by our results. Rather, Relationship management need to consider each relationship according to the importance that the counterparts in that relationship place on the different attributes.

The study suggested that the firm's management should consider the development of the existing web site to provide product ordering and order tracking facilities on-line as a

first step. All the respondents expected the delivery attribute, an important attribute of existing relationships, to be positively affected by e-commerce and saw the greatest benefits to be in terms of information gathering and the reduction of lead times. This reflected the views of interviewees who had already entered into virtual inventory management agreements, suppliers who had developed systems for Internet based product ordering and customers who were expecting suppliers to be able to receive electronic point-of-sale data as an aid to reducing product supply lead times.

Some of the literature suggests that relationships will tend to become more adversarial as a result of the adoption of e-commerce. The evidence in this case suggests that the firms would be brought closer together by e-commerce as information flows across the supply chain increase. The study was carried out in a context of a limited buyer-supplier network where there were already well established personal relationships and where the importance of non price attributes were recognised. The judgemental modelling approach can equally be applied in other contexts to help managers to decide how best to respond to the opportunities and threats posed by the fast growing area of B2B e-commerce.

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