

Power and interdependence in Kraljic's purchasing portfolio matrix

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Abstract / Summary

Kraljic's purchasing portfolio approach has inspired many academic writers to undertake further research into purchasing portfolio models. Although it is evident that power and dependence issues play an important role in the Kraljic matrix, scant quantitative research has been undertaken in this respect. In our study we have filled this gap by proposing quantitative measures for 'relative power' and 'total interdependence'. By undertaking a comprehensive survey among Dutch purchasing professionals, we have empirically quantified 'relative power' and 'total interdependence' for each quadrant of the Kraljic portfolio matrix. We have compared theoretical expectations on power and dependence levels with our empirical findings. A remarkable finding is the observed supplier dominance in the strategic quadrant of the Kraljic matrix. This indicates that the supplier dominates even satisfactory partnerships. In the light of this finding future research cannot assume any longer that buyer-supplier relationships in the strategic quadrant of the Kraljic matrix are necessarily characterised by symmetric power.

Keywords

Purchasing portfolio matrices, buyer-supplier relationships, power and interdependence

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1. Introduction

Purchasing portfolio models have received much attention in recent literature about professional purchasing. Kraljic's seminal paper in the *Harvard Business Review* in 1983 has not only had a broad influence on professional purchasing (see the evidence of Kamann and Bakker, 2004; Gelderman, 2003), it also inspired many academic writers to undertake further research into portfolio models (e.g. Gelderman and Van Weele, 2002, 2003; Dubois and Pedersen, 2002; Zolkiewski and Turnbull, 2002; Nellore and Soderquist, 2000; Wynstra and ten Pierick, 2000; Croom, 2000; Bensaou, 1999; Lilliecreutz and Ydreskog, 1999; Olsen and Ellram, 1997; Wagner and Johnson, 2004; Dyer et al, 1998).

Kraljic's model classifies a firm's purchased intermediate goods into four categories on the basis of two dimensions: (1) profit impact and (2) supply risk. Recent adaptations and refinements of Kraljic's model have led to alternative portfolio models using other classification dimensions (e.g. Van Stekelenborg and Kornelius, 1994; Olsen and Ellram, 1997; Bensaou, 1999). However, the fundamental assumption of all portfolio models seems to be the occurrence of differences in power and dependence between buyers and suppliers (Dubois and Pedersen, 2002). Kraljic (1983) does not explicitly deal with issues of power and dependence. However, some of his recommendations obviously refer to the power structure ('exploit power'). Others are aimed at reducing the dependence on suppliers ('diversify'). Moreover, Kraljic (1983: 112) stated that the general idea of the portfolio approach is to "minimize supply vulnerability and make the most of potential buying power". Therefore, power and dependence play a significant part in the Kraljic approach.

Yet, little is known about the exact way in which power and dependence in buyer-supplier relationships enter the Kraljic matrix (Gelderman and Van Weele, 2003; Dubois and Pedersen, 2002). Empirical research on the impact of power and dependence on buyer-supplier relationships is even more scarce. Portfolio models that discuss power and dependence issues in relation to portfolio matrices generally focus on the strategic quadrant (Wagner and Johnson, 2004). Buyer supplier relationships in this quadrant can be characterized as strategic partnerships. However, recent studies acknowledge that not all supplier relationships can or should be close partnerships (e.g. Gadde and Snehota, 2000; Wagner and Johnson, 2004). Moreover, it is found beneficial to firms to undertake a variety of relationships with different suppliers (Lilliecreutz and Ydreskog, 1999). Therefore it is of key importance to undertake research into power and dependence in all quadrants of the portfolio matrix for all relationship types.

The aim of this paper is to design measurable variables for power and dependence in buyer-supplier relationships and to relate these variables to the quadrants of the Kraljic purchasing portfolio matrix. A further objective of this paper is to test hypotheses that emanate from the literature with respect to power and dependence. For this purpose we have developed and administered a survey among 200 purchasing professionals. On the basis of the survey we analyze the influence of power and dependence in all quadrants of the Kraljic matrix. In general terms this study contributes to a better understanding of the underlying mechanisms of the portfolio approach in purchasing and supply management.

The organization of the paper is as follows. First we will give a brief overview of the Kraljic approach and, on the basis of recent literature, we will identify hypotheses with respect to power and dependence for each quadrant. Furthermore, we will operationalise power and dependence into measurable variables (section 2). In section 3 we will present our survey design and design constructs for our key variables. The results of our survey are presented in section 4. Section 5 will conclude and give suggestions for further research.

2. Conceptual background

2.1 The Kraljic matrix

Kraljic (1977, 1983) introduced a comprehensive *portfolio approach* as a tool for professional purchasers. With the help of the portfolio matrix, professional purchasers could optimize the use of capabilities of different suppliers (Nellore and Söderquist, 2000) and thereby effectively manage suppliers. Kraljic's approach includes the construction of two portfolio matrices. The first matrix classifies a firm's purchased products on the basis of two dimensions: profit impact and supply risk. Each dimension has two possible values: 'low' and 'high'. The resulting 2x2 matrix consists of four quadrants (see Table 1). Depending on the category, Kraljic identifies certain 'main tasks' for the firm in the interaction with its supplier. He also identifies the required information and the decision level in organizations per category.

Table 1: The Kraljic purchasing portfolio model (modified from Kraljic, 1983, p. 111)

Profit impact	Risk	
	Low	High
High	<i>leverage items</i> exploitation of purchasing power	<i>strategic items</i> diversify, balance, or exploit
Low	<i>non-critical items</i> efficient processing	<i>bottleneck items</i> volume assurance

The main purpose of Kraljic's approach is to identify strategic items. The second Kraljic matrix focuses on this category. This matrix shows the relative power position of the company in the corresponding supply markets. Three general purchasing strategies are distinguished, depending on the balance of power in the buyer/seller relationship: exploit (in case of buyer dominance), balance (in case of a balanced relationship), and diversify (in case of supplier dominance).

Note that Kraljic does not pay much attention to strategic aspects of product categories other than the strategic items. Other scholars have filled this gap (e.g. Van Weele; 2000; Syson, 1992; Elliott-Shircore and Steele, 1985). They refined the original matrix and elaborated on the 'main tasks' for bottleneck, non-critical and leverage items. In addition, they formulated strategic recommendations, resulting in one overall purchasing strategy for each cell/category. Table 2 gives an overview of the refined portfolio models and the resulting purchasing strategies proposed by various authors.

A comparison of different portfolio models suggests that there are more similarities than differences. The matrices proposed by Elliott-Shircore and Steel (1985), Hadelor and Evans (1994), Lilliecreutz and Ydreskog (1999), Olsen and Ellram (1997), and Van Weele (2000) are very similar to the original Kraljic matrix. The models employ practically the same dimensions, the same categories and the same recommendations. They all aim for identifying the '(un)important' items. The model of Bensaou (1999) is the only real outsider, with more differences than similarities in comparison with the Kraljic approach.

Although power and interdependence issues underpin these purchasing strategies, they are not explicitly discussed in any of these studies. The purchasing strategies for each of the Kraljic quadrants give rise to hypotheses on the importance of power and dependence in the Kraljic matrix. In section 2.3 we will revisit these strategies and connect them to the power and interdependence balance.

Table 2: Overview and comparison of purchasing portfolio models and purchasing strategies

	Elliott-Shircore and Steel (1985)	Hadeler and Evans (1994)	Lilliecreutz and Ydreskog (1997)	Olsen and Ellram (1997)	Bensaou (1999)	Van Weele (2000)
name of the model	Procurement positioning overview	Supply strategy square	Classification model	Portfolio model	Portfolio of relationships	Purchasing portfolio
matrix dimensions	Profit/value potential	Product's value potential	Economic profile	Strategic importance	Supplier's specific investments	Profit impact
	Supply vulnerability	Product's complexity	Complexity and risk profile	Difficulty of managing the purchase situation	Buyer's specific investments	Supply risk
category labels	strategic critical tactical profit strategic security tactical acquisition	(not specified)	strategic leverage bottleneck non-critical	strategic leverage bottleneck non-critical	strategic partnership captive supplier captive buyer market exchange	strategic leverage bottleneck non-critical
recommended purchasing strategy for:						
strategic items	manage suppliers	strategic partnerships		close relationships		partnership
leverage items	drive profit	global trading	(not specified) desired co-operation with the supplier of the product	leverage volume	management profiles in terms of information sharing, tasks and climate for each category	exploitation of power
bottleneck items	ensure supply	close relationships		standardize and find substitutes		assurance of supply
non-critical items	minimise attention	simple contracts		standardize and consolidate		systems contracting

2.2 Power and interdependence

Firms always depend, to varying extents, on their trading partner. Early studies on dependence focused on the effects for the buyer of its dependence on the supplier, without taking into account the supplier's dependence (e.g., El-Ansary and Stern, 1972). More recent studies have incorporated dependence from the perspective of the buyer as well as the supplier (Buchanan, 1992; Kumar et al. 1995; Geyskens et al., 1996). In other words, dependence is mutual.

Mutual dependence and power are closely related concepts. The buyer's dependence on the supplier is a source of power for the supplier, and vice versa. An appealing and well-known definition is that the relative power of an organization over another is the result of the net dependence of the one on the other. If A depends on B more than B depends on A, then B has power over A (Pfeffer, 1981). Similarly, Bacharach and Lawler define relative power as "the dependence of one party compared to the dependence of the other party" (1981: 65).¹

Buchanan (1992) conceptualized power-dependence imbalances in buyer-supplier relationships as the difference in value that buyers and sellers attach to the relationship. In asymmetric relationships, the most independent partner dominates the exchange. Balanced relationships refer to domination of neither party (Buchanan, 1992). Kumar et al. (1995) use the term interdependence asymmetry in this respect, which is defined as the difference between the two partner's levels of dependence. Symmetrical interdependence exists when parties are equally dependent on each other.

Buyer supplier relationships that are characterized by asymmetric interdependence are more dysfunctional because the independent partner experiences high power and will be attempted to exploit it (Anderson and Weitz, 1989; Geyskens et al., 1996). McDonald (1999) states in this respect that power imbalances within a buyer-supplier relationship can lead to unproductive partnerships. In the long term the position of the weaker party will be eroded too much and the partnership will be destroyed. Anderson and Weitz point out that "imbalanced channel relationships are characterised by less cooperation and greater conflict" (1989, p. 312).

All the above conceptualizations of power and interdependence can be traced to Pfeffer's (1981: 99) viewpoint that the relative power of one social actor over another is the result of the net dependence of the one on the other. In this study we will therefore measure the buyer's relative power as the difference between supplier's dependence and buyer's dependence. Similarly, we will measure the supplier's relative power as the difference between buyer's dependence and supplier's dependence.

Various researchers have argued that a comprehensive view of the interdependence of a dyadic relationship should include not only *interdependence asymmetry* (or relative power), but also *total interdependence* (or total power), for example Bacharach and Lawler (1981); Gundlach and Cadotte (1994); Kumar et al. (1995); Frazier and Antia (1995); Geyskens et al. (1996). The total interdependence refers to the intensity of a relationship. A high level of total interdependence is an indicator for a strong, co-operative long-term relationship in which both parties have invested. Mutual trust and mutual commitment will characterize those relationships (Geyskens et al., 1996). Besides this loyalty towards the other partner and the accompanying desire to continue the relationship, there is an alternative motivation for both firms to keep the partnership in tact. In the case that both parties know that the other party possesses much power, it is not likely that either side is going to use it. The risk of retaliation is often considered as being too high (Ramsay, 1996). In addition, when total interdependence is high, both partners are faced with high exit barriers (Geyskens et al., 1996). In accordance with Bacharach and Lawler (1981: 61), we will measure total interdependence in a relationship by "the sum of the parties' dependence on one another".

2.3 Relative power and total interdependence in the Kraljic matrix

In section 2.1 we referred to purchasing strategies for each of the four Kraljic quadrants. We will use these strategies to characterize the relation between the Kraljic quadrants and the power-dependence balance in buyer-supplier relationships.²

Strategic products represent a considerable value to the organization in terms of a large impact on profit and a high supply risk. Examples are engines and gearboxes for automobile manufactures, turbines for the chemical industry and bottling equipment for breweries. Often strategic products can only be purchased from one supplier (single source), causing a significant supply risk. In order to counterbalance this risk, firms will aim at building a partnership relationship with its supplier (Elliott-Shircore and Steele, 1985). The mutual trust and commitment that comes with the intensified relationship is likely to reduce the supply risk to a minimum. A close and lasting co-operation with suppliers will lead to improvements in product quality, delivery reliability, lead times, product development, product design, and it will lead to cost reduction (Tuten and Urban, 2001; Hadelar and Evans, 1994). The situation can be characterized as one with balanced power. Buyer and supplier are both heavily involved in the partnership, therefore the mutual dependence is expected to be high. Total interdependence is high as well, since the relationship is very intense.

Bottleneck products have less influence on the financial results of a firm, however, they are vulnerable with regard to their supply. Suppliers have a dominant power position for these products (Kempeners and Van Weele, 1997). The purchasing strategy is therefore primarily focused on assurance of supply, if necessary even at additional cost. Keeping extra stocks of the materials concerned or developing consigned stock agreements with suppliers are examples of this strategy. Firms can make a risk analysis to determine the most important bottleneck products and the consequences hereof. Contingency planning might be a possibility for dealing with unexpected bad situations. Since the buyers and suppliers are not highly involved in the relationship, total interdependence in this quadrant is expected to be lower than in the strategic quadrant.

In general *leverage products* can be obtained from various suppliers. These products represent a relatively large share of the end product's cost price in combination with a relatively low supply risk. As a consequence, this segment is buyer dominated (Kempeners and Van Weele, 1997). The buyer has many possibilities and incentives for negotiation, since small percentages of cost savings usually involve large sums of money (Olsen and Ellram, 1997). At the same time the supply risk is minimal. These characteristics justify an aggressive approach to the supply market (e.g. Van Weele, 2000). Frequently, a purchasing strategy on the basis of principles of competitive bidding is pursued. Since suppliers and products are interchangeable, there is no need for long-term supply contracts. In general, a coordinated purchasing approach is adopted that has the form of a centrally negotiated umbrella agreement with preferred suppliers. Call-off orders are then placed as an administrative formality. The buying power is actively used to get better deals with interchangeable suppliers. Total interdependence is expected to be moderate. Although the supplier's dependence is expected to be high, the buyer's dependence is expected to be quite low.

Non-critical products usually have a small value per unit. Many alternative suppliers can be found for these products. From a purchasing point of view, these items cause only few technical or commercial problems. As a rule of thumb routine products require 80% of the purchasing department's time, while they often represent less than 20% of the purchasing turnover. The handling of these products requires a purchasing strategy aimed at reducing the logistic and administrative complexity (Olsen and Ellram, 1997). Systems contracting is generally advised as the way of doing business with suppliers of routine products (Elliott-Shircore and Steele, 1985; Kempeners and Van Weele, 1997). The main idea is to enhance

purchasing power by standardization and bundling of purchasing requirements. The routine character of the transaction implies that the mutual dependence between buyers and suppliers is balanced. Total interdependence is low, since the buyer's dependence and the supplier's dependence will be both quite low.

In sum, the segments in the Kraljic matrix correspond to four basic power-and-dependence positions. Table 3 shows our hypotheses for the balance of power and the level of interdependence in each of the four segments. BD refers to buyer's dependence, SD denotes supplier's dependence.

Table 3: Expectations on the basis of the literature with respect to relative power and total interdependence in the Kraljic matrix

Categories	Conclusion from the literature	Relative power	Total interdependence
strategic items	balanced power, high level of interdependence	$BD = SD$	$(BD + SD)$ in the <i>strategic</i> quadrant $>$ $(BD + SD)$ in the other quadrants
bottleneck items	supplier dominated, moderate level of interdependence	$BD > SD$	$(BD + SD)$ in the <i>bottleneck</i> quadrant $<$ $(BD + SD)$ in the <i>strategic</i> quadrant and $(BD + SD)$ in the <i>bottleneck</i> quadrant $>$ $(BD + SD)$ in the <i>non-critical</i> quadrant
leverage items	buyer dominated, moderate level of interdependence	$BD < SD$	$(BD + SD)$ in the <i>leverage</i> quadrant $<$ $(BD + SD)$ in the <i>strategic</i> quadrant and $(BD + SD)$ in the <i>leverage</i> quadrant $>$ $(BD + SD)$ in the <i>non-critical</i> quadrant
non-critical items	balanced power, low level of interdependence	$BD = SD$	$(BD + SD)$ in the <i>non-critical</i> quadrant $<$ $(BD + SD)$ in the other quadrants

Note that *BD* refers to buyer's dependence, *SD* denotes supplier's dependence

3. Methodology

3.1 Survey design, sample and response

Our hypotheses were tested in a survey among 200 purchasing professionals. For this purpose we translated each of the purchasing strategies discussed in section 2.3 into comprehensive descriptions of real-life situations (scenarios). Respondents were asked to place themselves in the role of a purchasing expert of their own company. The description of the four scenarios is given in Table 4.

The survey adopts a repeated measures design, i.e. respondents had to evaluate a series of identical questions for every scenario. The questions refer to buyer's dependence and supplier's dependence. Below we discuss how constructs were developed for these two variables (section 3.2). An often-voiced drawback of the adopted research method is that respondents might not be able to fully visualize themselves in the proposed descriptions, resulting in unreliable answers. We countered this shortcoming by including an entry for recognition of the scenario, i.e. respondents were asked to assess the degree in which they recognize the described situation. In the analysis of the data, we removed the survey results for respondents with low scores on 'recognition' from the database. In this way we ensured the validity of our results.

Table 4: Description of the scenarios corresponding to the Kraljic quadrants

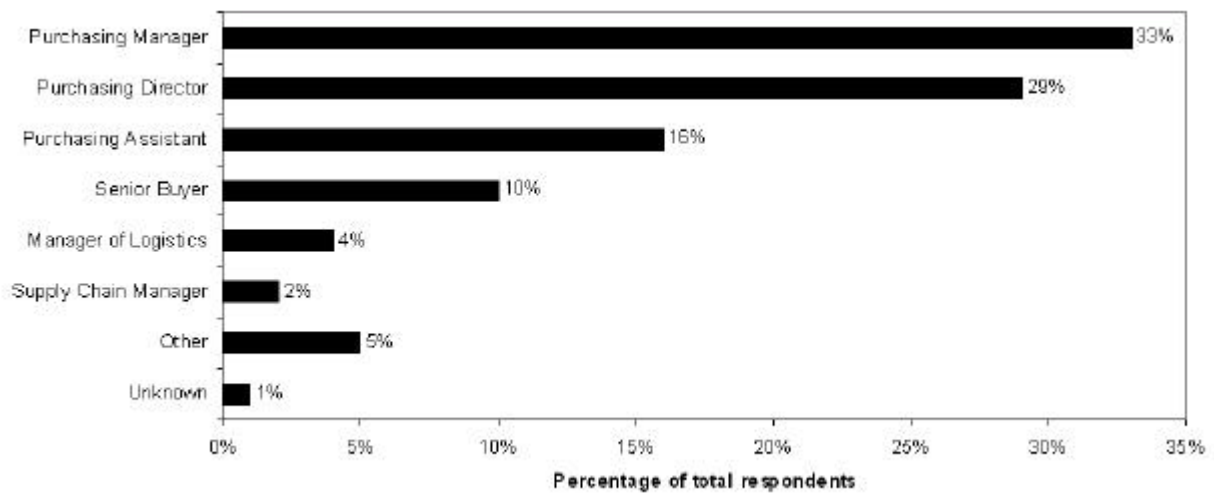
Scenario	Characterization	Corresponding Kraljic quadrant	Scenario description
1	maintain partnership	strategic quadrant	Consider a product with a high purchasing risk and a high financial value. You consider the supplier as an important partner with whom a satisfactory strategic relationship exists. The performance of the supplier is excellent. Both parties have an interest in continuing the relationship and the parties have a good mutual understanding.
2	keep safety stocks	bottleneck quadrant	Consider a product with a relative low financial value, but a high purchasing risk. Your firm is vulnerable regarding the supply of one supplier. You try to ensure a constant supply by keeping high stocks.
3	partner of convenience	leverage quadrant	You have a very favorable negotiating position with this product. The purchasing risk is low, while the product has a relatively high financial value. Negotiations are fierce. You let those suppliers prevail that offer the lowest price while guaranteeing quality and prompt delivery. Competitive bidding is one of your tactics. You only allow short-term contracts.
4	pooling of requirements	non-critical quadrant	Consider a product that has a relative low financial value and a low purchasing risk. The product is not very critical for your company, but still it has to be purchased. You choose to buy the product as a part of a package of similar products from a certain supplier. In this way it is possible to have only one supplier for several products.

The survey procedure included a pilot study aimed at enhancing the reliability and the validity of the questionnaire. The final questionnaire has been administered to 1,153 members of the Dutch Association of Purchasing Management (NEVI) in three rounds. We specifically targeted these purchasing professionals, because of their vast experience, expertise and insight into the development of supplier relationships. See Figure 1 for the respondent profile.

A total number of 248 responses were received, resulting in a response rate of 21.5% (248/1,153). Questionnaires that were completed for less than 90% were declared invalid. Hence, a total of 10 reactions were discarded due to incomplete information. In addition, all responses were removed that scored on average less than 3 for recognition on a 5-point Likert scale. In this way, another 22 responses were omitted, resulting in an effective response rate of 18.7% (216/1,153).

The likelihood of a non-response bias³ was investigated using the procedure recommended by Armstrong and Overton (1977). They state that it is safe to assume that late respondents are similar to non-respondents in many respects. Therefore, one should always compare the results of the first category of returned questionnaires (first-wave, early respondents) to the results of the second category of returned questionnaires (second-wave, late respondents). All our tests indicated that no statistical significant differences were found between the first wave and the second wave of respondents⁴. Therefore, we conclude that our study does not suffer from a non-response bias.

Figure 1: Respondent profile



3.2 Developing constructs for buyer's and supplier's dependence

Many conceptual studies discuss determinants of organizational dependence. Jacobs (1974) introduces two concepts from economic theory to describe dependence, namely 'essentiality' and 'substitutability'. He points out that it is of primary importance to the concept of dependence whether A can do without B (essentiality of a resource) or whether other sources are available (substitutability of the resource). Scholars in Resource Dependence Theory refer to 'essentiality' as 'the importance of a resource', which is said to be determined by (1) the relative financial magnitude of the resource and (2) the criticality of the resource (Pfeffer and Salancik, 1978). On the other hand, substitutability can be subdivided in (1) the availability of alternative sources and (2) the level of relation specific investments (i.e. the costs involved with switching between suppliers) (e.g. Bourantas, 1989).

In addition to these conceptual studies, several empirical studies pay attention to the concept of organizational dependence. However, most of these studies regard organizational dependence as an explanatory variable instead of trying to find its determinants. The few studies that try to explain the determinants of organizational dependence (Sriram et al., 1992; Berger et al., 1995; Nooteboom et al., 2000) find similar factors as indicated by the conceptual studies above. In all empirical studies 'importance' and 'substitutability' determine dependence, whereby importance is found to have a positive impact on dependence and substitutability is found to have a negative impact. The empirical studies do not provide decisive answers concerning the statistical significance of the determinants of dependence. Only some tentative empirical evidence can be found that importance and substitutability have a significant impact on dependence.

In summary, the analysis of conceptual and empirical studies shows that there are four main determinants of organizational dependence:

- (1) the financial magnitude of the exchanged resources
- (2) the criticality of the resources,
- (3) the availability of alternative sources
- (4) switching costs, incurred when replacing a trading partner.

In literature organizational dependence is regarded as one large container concept. However, in order to use the concept of organizational dependence for our analysis, we need to distinguish between buyer's dependence and supplier's dependence.

It is reasonable to assume that our first determinant of organizational dependence, the relative financial magnitude of transactions, particularly impacts on the supplier's

dependence. Obviously, when a lot of money is involved the buyer has a powerful position in negotiations. Factors such as the availability of alternative suppliers and low switching costs between suppliers are much more important to the buyer than the relative amount of money that is involved. Therefore, we have excluded ‘financial magnitude’ from our construct of buyer's dependence and included it in our supplier’s dependence construct.

There is a difference in the perspective of buyers and suppliers with regard to the second component of dependence as well. The criticality of a resource refers to the degree in which the organization is able to continue its business processes in the absence of the resource. In essence, however, the concept is two-fold in nature. On the one hand it refers to a need for technological expertise of the partner, on the other hand it points to issues of logistical indispensability (Cagliano et al., 2002). The need for technological expertise is critical for both parties, buyer and supplier. In an industrial context, companies rely more and more on technologically advanced (key) suppliers. From the supplier’s perspective a similar argument holds. Companies increasingly need the critical expertise and specialized knowledge of their (industrial) customers. Logistics-based dependence, on the other hand, is less an issue to the supplier than it is to the buyer. This unilateral dependence on the part of the buyer is explained in transaction cost theory by the concept of asset specificity (Nooteboom, 1993). The buyer is chiefly interested in receiving the goods in a way that is logistically compatible with its own production system. In contrast, the supplier will deliver the goods in any logistic way that is required, as long as the buyer will pay for it. The buyer's main concern is the correct delivery of the goods, which makes the buyer dependent on the specific assets of a certain supplier. The supplier's main concern is only of a financial nature. On the basis of these considerations we have redefined the concept of resource criticality in the construct of supplier’s dependence to solely include the need for the buyer’s technological expertise. The construct for buyer's dependence includes the logistical indispensability of the supplier, in addition to the need for a supplier’s technological expertise.

With respect to the availability of alternative sources and switching costs the dependence positions of buyers and suppliers are symmetrical. The buyer depends as much on the supplier as the other way around. Both buying and supplying organizations invest in the relationship with their trading partner. When the supplier develops and uses dedicated equipment assigned exclusively to one customer this will result in high switching costs if the relationship deteriorates. On the other hand, buying organizations also face relation specific investments, making significant investments in suppliers.

For obvious reasons the overall dependency on the other party is also included in both variables, the construct of buyer's dependence and the construct of supplier's dependence. Table 5 summarizes the components of each of the three main characteristics of buyer supplier relationships that we have identified in this section.

Table 5: Variables, constituting buyer’s dependence and supplier’s dependence

Construct	buyer’s dependence	supplier’s dependence
Components	logistical indispensability	financial magnitude
	need for supplier’s technological expertise	need for buyer’s technological expertise
	availability of alternative suppliers	availability of alternative buyers
	switching costs buyer	switching costs supplier
	overall buyer’s dependence	overall supplier’s dependence

3.3 Reliability analysis

A reliability analysis using Cronbach's alpha was performed to ensure the internal consistency of the indicators that constitute each construct (Cronbach, 1951). In Table 6 we present the results of our reliability analysis. The table shows the values of Cronbach's alpha for each of the four Kraljic quadrants. The coefficients of Cronbach's alpha are all higher than 0.60, indicating an acceptable internal consistency and reliability of the constructs.

Table 6: Reliability analysis: Cronbach's alphas

Construct	Buyer's dependence	Supplier's dependence
Category in the Kraljic matrix		
strategic quadrant	0.64	0.74
bottleneck quadrant	0.61	0.76
leverage quadrant	0.64	0.69
non-critical quadrant	0.67	0.72

4. Results

A comprehensive view of the dyadic nature of buyer-supplier relationships should include the assessment of (1) the difference between buyer's and supplier's dependence (net dependence) which corresponds to the *relative power* of each party; and (2) the sum of buyer's and supplier's dependence (*total interdependence*) which indicates the intensity and development phase of the relationship between parties.

Table 7: Power and interdependence in the matrix (n = 216)

scenario	buyer's dependence (1) *	supplier's dependence (2) *	relative power (2) - (1) **	total interdependence (1) + (2) ***	
strategic quadrant	maintain partnership	4.03	3.31	- 0.72 ^a	7.34
bottleneck quadrant	keep safety stocks	3.66	2.32	- 1.34 ^a	5.97
leverage quadrant	partner of convenience	2.41	2.68	+ .27 ^a	5.09
non-critical quadrant	pooling of requirements	1.90	1.97	+ .07	3.87

* *supplier's and buyer's dependence are measured on a 5-point Likert scale*

** *power is measured on a scale from -4 (maximum supplier's dominance) to + 4 (maximum buyer's dominance)*

*** *total interdependence is measured on a scale from +2 (minimum interdependence) to + 10 (maximum interdependence)*

^a difference between supplier's dependence and buyer's dependence is significant at $p < .05$

Table 7 shows the average supplier's dependence and average buyer's dependence in the four scenarios (measured on a 5-point Likert scale). The last two columns in Table 7 show the

resulting findings for the power balance and total interdependence. The table shows the relative power position of the buyer, i.e. the difference between supplier's dependence and buyer's dependence. Therefore, a negative sign for the power balance shows that the supplier dominates the relationship, whereas a positive sign points to buyer dominance. Total interdependence (last column in Table 7) is measured by the sum of buyer's dependence and supplier's dependence. On a scale that runs from +2 (minimal interdependence) to +10 (maximum interdependence) we consider values below 5 as low, between 5 and 7 as moderate and above 7 as high.

Several points emerge from Table 7 with respect to the power balance. Column 1 in Table 7 shows a relatively high buyer's dependence on the right hand side of the Kraljic matrix (bottleneck and strategic quadrant), and a relatively low buyer's dependence on the left hand side of the matrix (non-critical and leverage). These findings are in accordance with our prior expectations. Column 2 in Table 7 indicates that the findings for supplier's dependence are not clear-cut. Remarkably, the supplier's dependence in the leverage quadrant is *lower* than we might have expected in advance (2.68 on a 5-point scale). The same holds for the strategic quadrant, where the supplier's dependence is medium (3.31 on a 5-point scale). However, the relatively low supplier's dependence in the bottleneck and the non-critical quadrant confirm our expectations on the basis of the literature.

With respect to the power balance (column 3) we find that buyer-supplier relationships are dominated by the supplier in the bottleneck quadrant and in the strategic quadrant. In contrast, the buyer is dominant in the leverage quadrant. The t-tests showed that in all but one scenario the differences between supplier's and buyer's dependence is statistically significant. Note that the insignificant difference between supplier's dependence and buyer's dependence in the non-critical quadrant refers to a significant power balance in this quadrant.⁵

The results for the strategic quadrant are striking, since they suggest a significant dominance of the supplier. The literature puts a lot of emphasis on the idea that buyer-supplier relationships in this quadrant are typically characterized as satisfactory relationships based on trust, commitment and open communication (De Ruyter et al., 2001; Morgan and Hunt, 1994). Therefore, one would expect to find a balanced power-dependence relationship. However, our results suggest that such satisfactory relationships in the strategic quadrant have an asymmetric power balance. From the buyer's perspective the supplier dominates the relationship. When we examine the data in greater detail, this result can be traced back to the medium level of supplier's dependence (3.31 on a 5-point scale) and the high level of buyer's dependence (4.03 on a 5-point scale) that was reported by the respondents in our survey. This deviates from what is expected from the literature, which indicates that supplier's as well as buyer's dependence are high in the strategic quadrant.

When we look at the underlying data of the supplier's dependence construct (Table 8) we find that respondents reported that they:

- have more need for the supplier's technological expertise than vice versa, and
- face higher switching costs than the suppliers, and
- have fewer alternative trading partners than the supplier.

The last column of Table 7 shows the level of total *interdependence* in the various quadrants. From the literature on the Kraljic matrix we are expecting:

- high levels of interdependence in the strategic quadrant,
- moderate levels of interdependence in the bottleneck and leverage quadrant, and
- low levels of interdependence in the non-critical quadrant.

Table 8: Item scores and standard deviations (between parentheses) for the buyer's dependence and the supplier's dependence construct in the strategic quadrant

Buyer's dependence		Supplier's dependence	
logistical indispensability	4.63 (.541)	financial magnitude	3.95 (.761)
supplier's technological expertise	4.08 (.868)	buyer's technological expertise	3.32 (1.038)
alternative suppliers	2.81 (1.168)	alternative buyers	3.27 (1.079)
switching costs buyer	4.08 (1.074)	switching costs supplier	3.36 (1.131)
overall buyer's dependence	4.22 (.757)	overall supplier's dependence	3.25 (.998)

Several separate tests have been undertaken to determine whether total interdependence in one quadrant significantly differs from total interdependence in all other quadrants. The results are reported in Table 9, where $INDEP_{strat}$, $INDEP_{bottle}$, $INDEP_{lev}$ and $INDEP_{non}$ refer to total interdependence in the strategic, bottleneck, leverage and non-critical quadrant respectively.

Table 9: Differences with respect to interdependence between quadrants of Kraljic matrix

Results with respect to interdependence		
(1)	$INDEP_{strat} - INDEP_{bottle}$	+ 1.37 ^a
(2)	$INDEP_{strat} - INDEP_{non}$	+ 3.47 ^a
(3)	$INDEP_{strat} - INDEP_{lev}$	+ 2.25 ^a
(4)	$INDEP_{non} - INDEP_{bottle}$	- 2.10 ^a
(5)	$INDEP_{non} - INDEP_{lev}$	- 1.22 ^a

^a significantly different from zero at $p < .05$

The results largely confirm our expectations. Total interdependence has its highest value in the strategic quadrant, while it is lowest in the non-critical quadrant. As expected, total interdependence is moderate in the bottleneck and the leverage quadrant. We conclude that our empirical findings confirm the hitherto untested theoretical notions about total interdependence in buyer-supplier relationships.

5. Conclusion

Kraljic's approach has inspired many academic writers to undertake further research into purchasing portfolio models. Although it is evident that power and dependence issues play an important role in the Kraljic matrix, scant quantitative research has been undertaken in this respect. In our study we filled this gap by proposing quantitative measures for 'relative power' and 'total interdependence'. By undertaking a comprehensive survey among Dutch purchasing professionals, we empirically quantified 'relative power' and 'total interdependence' for each quadrant of the Kraljic matrix. We compared theoretical expectations on power and dependence levels with our empirical findings. Table 10 summarises the differences between what is expected in the literature and what is found in our study.

Most remarkable is the observed supplier dominance in the strategic quadrant. This seems to be a provocative result. This result sheds a new light on the buyer's view on issues of power and dependence. It indicates that the supplier dominates even satisfactory partnerships.

Future research cannot assume any longer that buyer-supplier relationships in the strategic quadrant of the Kraljic matrix are necessarily characterised by symmetric interdependence. Presumably, once a buyer has entered a partnership this ensures a disproportionate raise in the dependence of the buyer on the supplying partner.

Table 10: Comparison of power and interdependence in the Kraljic matrix: theory and practice

	relative power		total interdependence	
	expected	observed	expected	observed
strategic	balanced	supplier dominance	highest	highest
bottleneck	supplier dominance	supplier dominance	moderate	moderate
leverage	buyer dominance	buyer dominance	moderate	moderate
non-critical	balanced	balanced	lowest	lowest

It has been argued in the literature that a high level of relative power by one of the parties in an exchange relationship will lead to exploitation by the dominant party. The rationale is that the possession of relative power will encourage a firm to act opportunistically and take advantage of the other party (Frazier and Rody, 1991). However, our results suggest that unbalanced relationships may not always be troublesome: a known distribution of power between both partners could provide effective co-ordination of the exchange relationship. Our results appear to support the notion of Frazier and Antia (1995) that a relative power position can be used to enhance the nature of relational exchange between trading partners. It seems that the distribution of power can become legitimated over time, so that both social actors expect and value a certain pattern of influence. Provan and Gassenheimer (1994) pointed out that, while all power arises from dependence, it is not necessarily enacted or exercised. Although relative power is not always used, it may still be expected to influence decisions and strategies, just because it is recognised by both trading partners. Obviously, there is a need for further research that extends our understanding of the role and impact of power and interdependence in exchange relationships.

Our study holds an implication for future research that pertains to the sampling method in survey studies. Many studies ask respondents to express their opinions and view on their relationship with a single (type of) supplier, usually the key or the major supplier. This approach is justified in the case of channel studies (manufacturer- distributor). In a channel context, relations often revolve around one major supplier. However, this sampling approach is also often used in studies relating to industrial relationships in which the limitation to the largest supplier is not a self-evident point of departure. Alternatively, many studies invite respondents to answer questions referring to 'their suppliers' in general. On the basis of our study we conclude that both approaches do not provide a comprehensive insight into buyer-suppliers relationships. We have found evidence of the existence of four buyer-supplier relationships that differ significantly with respect to relative power and interdependence. This result confirms the notion that companies maintain a portfolio of differentiated supplier relationships. Therefore, neither reference to 'a key supplier' nor reference to 'suppliers' in general does take into account the full variation in the actual supplier base of a company. This common practice among researchers should only be used if the research question specifically requires such a sampling method. In all other cases it should be discarded. Future and further survey studies cannot ignore the large variety in supplier relationships any longer.

In addition, the operationalization in our study could serve as a promising point of departure for further quantitative research to the issues of power and dependence in buyer-supplier relationships. The level of relative power might be related to the sizes of the buying and the supplying companies. Alternatively, network positions or the positions in the supply chain could be included as a determining factor of relative power.

Concerning the limitations of our study, our survey was confined to purchasing experts. Further research should give insight into the perception of sales experts about their power position in satisfactory relationships. Suppliers might have different opinions on the power and interdependence structure of the various buyer-supplier relationships. Additional insight could be gained by capturing and exploring dyadic data. Furthermore, it would be interesting to know whether the observed findings hold for other sectors as well, for example services. This will be the object of a further study.

In general, further research should be directed towards the importance, impact and determinants of power relations in chains of interdependent companies (supply chain). In this respect we would encourage qualitative studies, which allow for in-depth listening to key informants. More research is needed to close the gap between the mainstream management literature and the daily reality of power and dependence in buyer-supplier relations.

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Notes

¹ Likewise, Dickson (1983) states that the power of one party over another is a function of *relative dependence*. Anderson and Narus (1990) also use the term *relative dependence* to refer to the difference between a firm's dependence on its partner and its partner's dependence on the firm. The primary consequence of relative dependence is indicated as power.

² See also Van Weele (2000).

³ Non-response refers to the difference between the answers of respondents and non-respondents (Lambert and Harrington, 1990).

⁴ The test results can be received from the authors.

⁵ This is confirmed by a separate t-test.