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Purchasing strategies in the Kraljic matrix—A power and dependence perspective

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Abstract

Kraljic's purchasing portfolio approach has inspired many academics to undertake further research into purchasing portfolio models. Refined models typically recommend one purchasing strategy for each portfolio quadrant. Yet, it has been shown that purchasers make a clear distinction between alternative purchasing strategies within each quadrant. The fundamental assumption of portfolio models seems to be that differences in power and dependence between buyers and suppliers exist. Still, little is known about how these concepts influence the choice for a specific purchasing strategy. In this paper, 'relative power' and 'total interdependence' for a number of portfolio-based purchasing strategies have been quantified empirically, using data from a comprehensive survey among Dutch purchasing professionals. The survey data largely confirmed the hypotheses that were deduced from the literature.
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1. Introduction

Purchasing portfolio models have received much attention in the recent literature about professional purchasing. One of the most famous portfolio models was introduced by Kraljic (1983). His model has 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, 2005; 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).

According to Kraljic (1983) a firm's supply strategy depends on two factors: (1) profit impact and (2) supply risk. Other scholars have introduced variations of the original Kraljic matrix (e.g. Elliott-Shircore and Steele, 1985; Syson, 1992; Hadeler and Evans, 1994; Olsen and

Ellram, 1997). The proposed matrices are very similar to the Kraljic matrix in that they employ comparable dimensions, and derive equivalent recommendations. Typically, these matrices give only one recommendation for each portfolio quadrant, namely: form partnerships for strategic products; assure supply for bottleneck products; exploit power for leverage products and ensure efficient processing for non-critical products. However, a recent study into the actual use of the matrix by professional purchasers pointed out that purchasers make a clear distinction between several strategies *within* each quadrant (Gelderman and Van Weele, 2003). Purchasers identify: (1) strategies to hold their position in the quadrant and (2) strategies to move to another position. However, the conditions determining the choice for a specific purchasing strategy within a quadrant are yet unclear.

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

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(1983, p. 112) stated that the general idea of the portfolio approach is to "minimize supply vulnerability and make the most of potential buying power". It seems that power and dependence play a significant role in the Kraljic approach. The relative power and dependence position of buyers and suppliers are therefore expected to be factors of importance in explaining the conditions that influence the choice of purchasing strategy within each quadrant.

Until now little is known about the conditions that influence the choice of purchasers to either hold their position in the quadrant or move. Moreover, little is known about the 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 scarcer. Therefore, it is critically important to examine the power and dependence positions of buyers and suppliers for the various purchasing strategies that have been identified in each quadrant of the portfolio matrix.

The goal of this paper is to empirically test several hypotheses that are deduced from the literature on power and dependence. This will be done with respect to the purchasing strategies in each quadrant of the Kraljic purchasing portfolio matrix. In order to do this we have defined the concepts of power and dependence in terms of buyer's and supplier's dependence. Subsequently, we have developed constructs for buyer's dependence as well as supplier's dependence. Our empirical analysis is founded on a survey among 250 purchasing professionals. On the basis of the survey data we have assessed power and interdependence in buyer–supplier relationships. In general terms this study contributes to a better understanding of the (perceived) power and interdependence in buyer–supplier relationships.

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 strategy used in practice (Section 2). Furthermore, we will operationalize power and dependence into measurable variables and formulate hypotheses (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 and hypotheses

2.1. The Kraljic purchasing portfolio matrix

Kraljic (1983) advised managers to guard their firms against damaging supply interruptions and to deal with continuous technological change and economics growth. In his seminal paper he called attention to the need for companies to attain more effective supply management. He proclaimed that "purchasing must become supply manage-

ment" (Kraljic 1983, p. 109). In his article he presents a figure in matrix format ("Exhibit I") that classifies the 'stages of purchasing sophistication' within companies. The matrix identifies four stages: (1) purchasing management; (2) materials management; (3) sourcing management; and (4) supply management. Kraljic (1983, p. 111) argues that supply management is particularly relevant in the case that the supply market is complex and the importance of purchasing is high.

In the second part of his article Kraljic (1983) proposes a four-stage approach as a framework for developing supply strategies for single products or product groups. In the first stage, a company classifies all its purchased products in terms of profit impact and supply risk. Subsequently, the company weighs the bargaining power of its suppliers against its own power. Then, the company positions the products that were identified in the first stage as strategic (high profit impact and high supply risk) in a portfolio matrix. Finally, it develops purchasing strategies and action plans for these strategic products, depending on its own strength and the strength of the supply market. Three general purchasing strategies are recommended: exploit (in case of buyer dominance), balance (in case of a balanced relationship), and diversify (in case of supplier dominance). It should be noted that Kraljic focuses on strategic products, for the other item categories Kraljic merely formulated a number of 'main tasks'. Other scholars have filled this gap (e.g. Van Weele, 2000; Syson, 1992; Elliott-Shircore and Steele, 1985). They have refined the 'matrix' and elaborated on the 'main tasks' for bottleneck, non-critical and leverage items. In addition, they have formulated strategic recommendations, resulting in an overall purchasing strategy recommendation for each portfolio quadrant (see Table 1). This matrix is commonly referred to as Kraljic's portfolio matrix (e.g. Olsen and Ellram, 1997; Lilliecreutz and Ydreskog, 1999; Van Weele, 2000; Gelderman, 2003). With the help of this matrix, professional purchasers can differentiate between the various supplier relations and choose strategies that are appropriate for each category and thereby effectively manage suppliers (Nellore and Soderquist, 2000).

A recent study by Gelderman and Van Weele (2003) paid attention to the experience of purchasing professionals with the use of the portfolio matrix in practice. On the basis of three in-depth case studies they found that practitioners

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

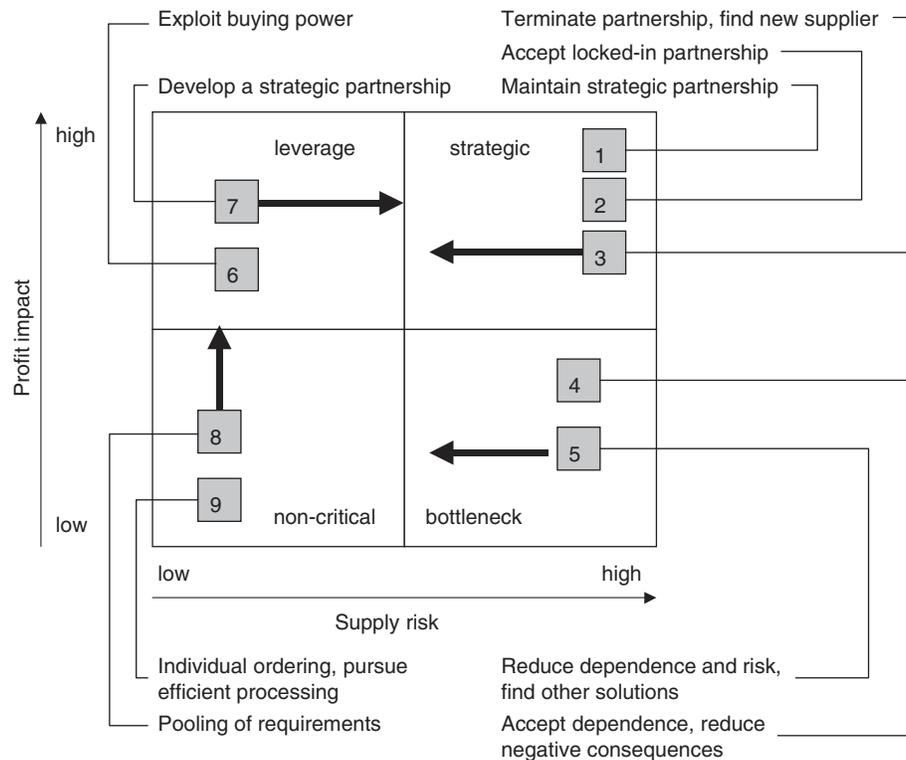| Profit impact	Supply risk	
	Low	High
High	*Leverage items* Exploit purchasing power	*Strategic items* Form partnerships
Low	*Non-critical items* Ensure efficient processing	*Bottleneck items* Assure supply

Fig. 1. Overview of purchasing strategies for all portfolio quadrants (modified from Gelderman and Van Weele, 2003, p. 212).

distinguish between several separate purchasing strategies within each portfolio quadrant. Some of these strategies focused on keeping the current position in the quadrant, while other strategies were directed towards moving to another position. Fig. 1 gives an overview of strategic directions for all categories.

While Gelderman and Van Weele (2003) showed that several strategies per quadrant occur in practice, the conditions determining the choice for a specific purchasing strategy remained an issue for further research. In the literature on buyer–supplier relationships it is generally acknowledged that power and interdependence issues are fundamental to the way in which buyers and suppliers interact. Therefore, it is reasonable to assume that power and dependence issues will also underpin the choice for a specific purchasing strategy.

Each purchasing strategy identified by Gelderman and Van Weele (2003) gives rise to hypotheses on the importance of power and dependence. In Section 2.3 we will revisit the strategies and connect them to the power and interdependence balance.

2.2. Power and interdependence[1]

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. A 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 (1981, p. 65) define relative power as "the dependence of one party compared to the dependence of the other party". Anderson and Narus (1990) 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.

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). In this respect, Kumar et al. (1995) use the term interdependence asymmetry, which is defined as the difference between the two partner's levels of dependence. Symmetrical

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[1]This section draws on Caniëls and Gelderman (2006).

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; Frazier and Rody, 1991). 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 (1989, p. 312) point out that "imbalanced channel relationships are characterized by less cooperation and greater conflict".

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), and Geyskens et al. (1996). 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).

From the above it can be concluded that the literature makes a clear difference between the concepts of: (1) relative power, which is the result of interdependence asymmetry; and (2) total power, which is the result of full interdependence of both parties on each other and which is commonly referred to as total interdependence. However, empirical research on the impact of relative power and total interdependence on buyer–supplier relationships is scarce. To be able to fill this void, we have defined both concepts in terms of buyer's and supplier's dependence (cf. Pfeffer, 1981; Bacharach and Lawler, 1981). In this study, we will 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. This is to conform Pfeffer's viewpoint (1981, p. 99) that the relative power of one social actor over another is the result of the net dependence of the one on the other. In accordance with Bacharach and Lawler (1981, p. 61), we will measure total interdependence in a relationship by "the sum of the parties' dependence on one another".

2.3. Hypotheses on relative power and total interdependence

We will develop hypotheses on the power-dependence balance for each purchasing strategy identified by Gelderman and Van Weele (2003) and presented in Section 2.1 (see also Van Weele, 2000).

2.3.1. Strategic items

These 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 manufacturers, 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. The general recommendation for supplier management in this quadrant is to maintain a strategic partnership. Purchasing practitioners employ two additional purchasing strategies in this quadrant, namely accept a locked-in partnership and terminate a partnership, find a new supplier (Gelderman and Van Weele, 2003).

1. *Maintain strategic partnership*: In order to counterbalance the supply risk, firms will aim at building a partnership relationship with its supplier (Elliott-Shircore and Steele, 1985). The mutual trust and commitment that is associated with an 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 result in cost reduction (Tuten and Urban, 2001; Hadeler and Evans, 1994). This situation can be characterized as one with balanced power. Buyers and suppliers are both heavily involved in the partnership, therefore mutual dependence is expected to be high. Total interdependence is high as well, since the relationship is very intense.

2. *Accept a locked-in partnership*: This strategy often occurs when the buyer is subject to unfavourable conditions of the supplier and is unable to pull out of the situation. The locked in position might be caused by the fact that the supplier holds the patent to a certain product and therefore has monopoly power to some extent. This situation can be characterized as one dominated by the supplier. Buyers and suppliers are not as much involved in the partnership as in scenario 1 described above, therefore total interdependence is expected to be lower than in scenario 1.

3. *Terminate a partnership*: This strategy is employed when a supplier's performance has become unacceptable and incorrigible. The buyer will try to reduce his dependence on the supplier. One way of achieving this is to search for alternative suppliers. In this situation the buyer still depends on the supplier, so we expect to find supplier dominance, although to a lesser extent than when the lock-in partnership is accepted as described in scenario

Table 2
Hypotheses on the basis of the literature with respect to relative power and total interdependence for the strategic quadrant

Purchasing strategy/scenario	Relative power		Total interdependence
1. *Maintain strategic partnership*	*Hypothesis* 1a: Balanced power $BD = SD$	*Hypothesis* 1b: Worse power position for the supplier in this scenario than in scenarios 2 or 3	*Hypothesis* 1c: Highest level of interdependence $(BD+SD)_1 > (BD+SD)_2$ $(BD+SD)_1 > (BD+SD)_3$
2. *Accept locked-in partnership*	*Hypothesis* 2a: Supplier dominance $BD > SD$	*Hypothesis* 2b: Best power position for the supplier. Supplier dominance$_2$ > Supplier dominance$_1$ Supplier dominance$_2$ > Supplier dominance$_3$	*Hypothesis* 2c: Moderate level of interdependence $(BD+SD)_1 > (BD+SD)_2$ $(BD+SD)_2 > (BD+SD)_3$
3. *Terminate a partnership*	*Hypothesis* 3a: Supplier dominance $BD > SD$	*Hypothesis* 3b: Moderate power position for the supplier Supplier dominance$_3$ > Supplier dominance$_1$ Supplier dominance$_2$ > Supplier dominance$_3$	*Hypothesis* 3c: Lowest level of interdependence $(BD+SD)_1 > (BD+SD)_3$ $(BD+SD)_2 > (BD+SD)_3$

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

2. The involvement of both parties in the relationship is expected to be the lowest in this situation compared to the ones described above, leading to the lowest total interdependence for this scenario.

Table 2 gives an overview of our expectations for the power balance and the level of total interdependence in each of the identified strategies.

2.3.2. Bottleneck items

These products have a moderate 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 that is commonly recommended for these products is primarily based on acceptance of the dependence and reduction of the negative effects of the unfavourable position. An alternative strategy suggested by purchasing practitioners is to find other suppliers and move towards the non-critical quadrant.

4. *Accept dependence, reduce negative consequences:* The main focus of this strategy is to assure supply, if necessary even at additional cost. Examples of this strategy are keeping extra stocks of the materials concerned or developing consigned stock agreements with suppliers. By performing a risk analysis firms can identify the most important bottleneck products and consider the implications. A possible action for dealing with unexpected bad dependence positions for certain products is to employ contingency planning.

5. *Reduce dependence and risk, find other solutions:* This strategy is geared towards reducing the dependence on the supplier. The most common way to achieve this is to broaden the specifications of the product or to search for new suppliers.

We expect the supplier dominance to be the highest in the case that the buyer accepts the dependence position, i.e. scenario 4. In case of scenario 5 the buyer searches for ways out of the current situation, and for this to be possible we expect the supplier dominance to be less fierce than in scenario 4. Total interdependence in situation 4 is expected to be higher than in situation 5, since buyers are not very involved in the relationship when they are searching for alternative suppliers. Table 3 gives an overview of our expectations for the power balance and the level of total interdependence in each of the identified strategies.

2.3.3. Leverage items

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. 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 directed towards exploitation of the buying power is pursued. Practitioners also identify an additional strategy in this quadrant, which is intended to change the current situation: develop a strategic partnership.

6. *Exploit buying power:* In this strategy the firm pursues competitive bidding. 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. This

Table 3
Hypotheses on the basis of the literature with respect to relative power and total interdependence for the bottleneck quadrant

Purchasing strategy/scenario	Relative power		Total interdependence
4. *Accept dependence, reduce the negative consequences*	*Hypothesis* 4a: Supplier dominance BD > SD	*Hypothesis* 4b: Best power position for the supplier. Supplier dominance$_4$ > Supplier dominance$_5$	*Hypothesis* 4c: Highest level of interdependence $(BD + SD)_4 > (BD + SD)_5$
5. *Reduce dependence and risk, find other solutions*	*Hypothesis* 5a: Supplier dominance BD > SD	*Hypothesis* 5b: Worst power position for the supplier. Supplier dominance$_4$ > Supplier dominance$_5$	*Hypothesis* 5c: Lowest level of interdependence $(BD + SD)_4 > (BD + SD)_5$

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

Table 4
Hypotheses on the basis of the literature with respect to relative power and total interdependence for the leverage quadrant

Purchasing strategy/scenario	Relative power		Total interdependence
6. *Exploit buying power*	*Hypothesis* 6a: Buyer dominance BD < SD	*Hypothesis* 6b: Best power position for the buyer. Buyer dominance$_6$ > Buyer dominance$_7$	*Hypothesis* 6c: Lowest level of interdependence $(BD + SD)_7 > (BD + SD)_6$
7. *Develop a strategic partnership*	*Hypothesis* 7a: Balanced power BD = SD	*Hypothesis* 7b: Better power position for the buyer in scenario 6 than in scenario 7	*Hypothesis* 7c: Highest level of interdependence $(BD + SD)_7 > (BD + SD)_6$

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

scenario is therefore characterized by buyer dominance (Kempeners and van Weele, 1997).

7. *Develop a strategic partnership*: In a few cases practitioners choose to abandon the leverage position and opt for a strategic partnership with a supplier. This cooperative strategy is only pursued when the supplier is willing and able to contribute to the competitive advantage of the buyer's firm. Hence, this role is only attainable for technologically advanced suppliers. In this scenario we expect to find a balanced power position between the buyer and supplier.

Total interdependence in scenario 7 is expected to be higher than in scenario 6, since buyers and suppliers become increasingly involved in the relationship when a strategic partnership is built. Table 4 gives an overview of our expectations for the power balance and the level of total interdependence in each of the identified strategies.

2.3.4. Non-critical items

These products usually have a small value per unit. In addition, many alternative suppliers can be found. 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. In general, in this situation purchasers are advised to pool purchasing requirements. In addition Gelderman and Van Weele (2003) identify the

strategy of individual ordering and pursue of efficient processing.

8. *Pool purchasing requirements:* The handling of noncritical 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.

9. *Individual ordering, efficient processing*: Whenever it is not possible to pool the purchasing requirements, professional purchasers adopt some kind of individual ordering, for instance by means of a purchase card. This strategy is aimed at reducing the indirect purchasing costs that are associated with administrative activities, such as ordering and invoicing.

In scenario 8 as well as 9 the routine character of the transaction implies that the relative power position between both parties is balanced. Total interdependence is expected to be lowest in scenario 9. Table 5 gives an overview of our expectations for the power balance and the level of total interdependence in each of the identified strategies.

In order to give a comprehensive overview of our expectations we have formulated hypotheses in each cell of

Table 5
Hypotheses on the basis of the literature with respect to relative power and total interdependence in the non-critical quadrant

Purchasing strategy/scenario	Relative power		Total interdependence
8. Pooling of requirements	*Hypothesis* 8a: Balanced power BD = SD	*Hypothesis* 8b: Better power position for the buyer in scenario 8 than in scenario 9	*Hypothesis* 8c: Highest level of interdependence $(BD+SD)_8 > (BD+SD)_9$
9. Individual ordering, pursue efficient processing	*Hypothesis* 9a: Balanced power BD = SD	*Hypothesis* 9b: Worse power position for the buyer in scenario 9 than in scenario 8	*Hypothesis* 9c: Lowest level of interdependence $(BD+SD)_8 > (BD+SD)_9$

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

Tables 2–5. Note that several of the hypotheses are identical and therefore redundant in a strict sense.

3. Methodology[2]

3.1. Survey design, sample and response

Our hypotheses were tested in a survey among 250 purchasing professionals. Each purchasing strategy discussed in Section 2.3 was translated into a comprehensive description of a real-life situation (scenario). The description of the scenarios is given in Appendix A.

The survey adopts a repeated measures design, i.e. respondents had to evaluate a series of identical questions for each 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). The distinct advantage of using a repeated measures design instead of other experimental designs is that the potential bias caused by individual differences among groups of respondents is taken away. Each of the respondents has to answer all questions in each scenario. Therefore, specific characteristics of the respondents, such as IQ, education and motivation, do not differ across the four groups that reply to the questions in each scenario. In sum, by adopting a repeated measures design, variability among groups of respondents is removed from the error term, which makes the design more powerful than randomized designs (Stevens, 2001).

A potential 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.

The survey procedure included a pilot study aimed at enhancing the reliability and the validity of the questionnaire. The pilot study entailed discussions with six purchasing professionals in four Dutch firms (DSM, AKZO, GTI and EMTEC). Several issues were discussed during these interviews, such as the clarity of the questionnaire items, the recognizability of the scenarios, the time needed to fill in the questionnaire and issues for further improvement of the items. On account of the pilot study several improvements have been made in the description and layout of the questionnaire items, response options and scenarios.

The final questionnaire has been administered to 1153 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 Fig. 2 for the respondent profile.

A total number of 248 responses were received, resulting in a response rate of 21.5% (248/1153). 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% (216/1153).

The likelihood of a non-response bias[3] 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 respondents.[4] Therefore, we conclude that our study does not suffer from a non-response bias.

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[2]Parts of this section draw on Caniëls and Gelderman (2006).

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

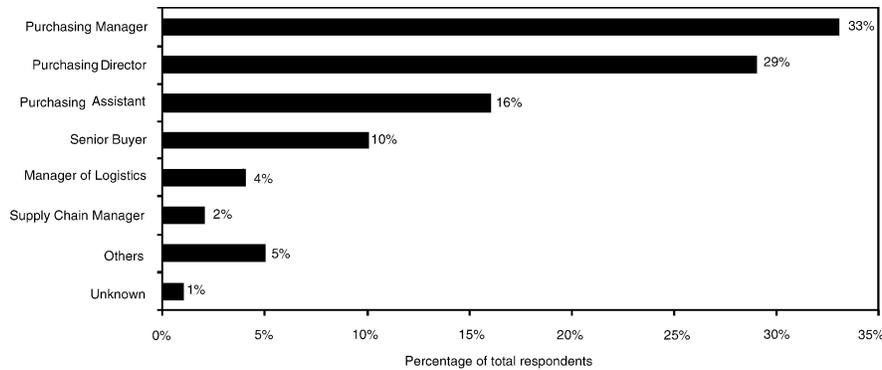[4]The test results can be received from the authors.

Fig. 2. Respondent profile.

3.2. Constructs for buyer's and supplier's dependence

Many studies discuss different aspects of organizational dependence (e.g. Sriram et al., 1992; Nooteboom et al., 2000). 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).

With these characteristics in mind we have set up constructs for buyer's dependence and supplier's dependence as follows. It is reasonable to assume that the first aspect of organizational dependence, the relative financial magnitude of transactions, particularly impacts on 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 6 summarizes the components of each of the three main characteristics of buyer–supplier relationships that we have identified in this section.

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 7 we present the results of our reliability analysis. The table shows the values of Cronbach's alpha for each purchasing strategy in the Kraljic matrix. The coefficients of Cronbach's alpha are all higher than 0.60, indicating an acceptable internal consistency and reliability of the constructs.

4. Results

4.1. Relative power and total interdependence

An evaluation of the nature of buyer–supplier relationships includes the assessment of: (1) net dependence, which corresponds to the relative power of each party; and (2) total interdependence, which refers to the intensity of the relationship between parties.

Table 8 shows the average score for buyer's dependence and supplier's dependence in the nine scenarios. The third column in Table 8 presents the resulting findings for the relative power position of the buyer, i.e. the difference between buyer's dependence and supplier's dependence.

A positive sign for the power balance shows that the supplier dominates the relationship, whereas a negative sign points to buyer dominance. Total interdependence is depicted in the last column in Table 8 and is measured by the sum of buyer's dependence and supplier's dependence. On a scale that runs from $+2$ (minimal interdependence) to $+10$ (maximal interdependence) we consider values below 5 as low, between 5 and 7 as moderate and above 7 as high.

Note that the repeated measure design of the survey was accounted for when analysing the data. We used Estimated Marginal Means (EMMEANS) in SPSS (General Linear Model-repeated measures) for the comparisons of the means in different scenarios. Bonferroni adjustments were made to control for Type I errors (Tabachnick and Fidell, 2001).

Several points emerge from Table 8. With respect to the power balance in the strategic quadrant the results indicate that buyer–supplier relationships are dominated by the supplier in each strategy that is pursued, rejecting hypothesis 1a and confirming hypotheses 2a and 3a. Furthermore, buyer–supplier relationships in the bottleneck quadrant are also dominated by the supplier, confirming hypotheses 4a and 5a. With respect to the leverage quadrant the hypotheses for both scenarios are confirmed as well. We find buyer dominance when buyers decide to exploit their buying power, confirming hypothesis 6a. In addition, the insignificant difference between supplier's dependence and buyer's dependence in the situation that parties try to form a partnership points to a situation of balanced power, confirming hypothesis 7a. Both strategies in the non-critical quadrant are characterized by a significant power balance, thereby confirming hypotheses 8a and 9a.

In sum, the findings confirm all hypotheses on basis on the existing literature on buyer–supplier relationships, except for the expectation of power balance in the case that a strategic partnership is maintained (scenario 1 in the strategic quadrant). The literature characterizes this kind of buyer–supplier relationships as satisfactory relationships based on trust, commitment and open communication (e.g.

Table 6
Aspects of the construct for buyer's dependence and supplier's dependence

Buyer's dependence	Supplier's dependence
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

Table 7
Reliability analysis: Cronbach's alphas

Quadrant in the Kraljic matrix	Purchasing strategy/scenario	Construct	
		Buyer's dependence	Supplier's dependence
Strategic	1. Maintain a strategic partnership	0.64	0.74
	2. Accept a locked-in relationship	0.70	0.79
	3. Terminate a partnership, find a new supplier	0.66	0.78
Bottleneck	4. Accept dependence, reduce the negative consequences	0.61	0.76
	5. Reduce dependence and risk, find other solutions	0.63	0.69
Leverage	6. Exploit buying power	0.64	0.69
	7. Develop a strategic partnership	0.71	0.70
Non-critical	8. Pooling of requirements	0.67	0.72
	9. Individual ordering	0.69	0.72

Table 8
Power and interdependence in the matrix ($n = 216$)

Quadrant in the Kraljic matrix	Purchasing strategy/scenario	Buyer's dependence (1)[a]	Supplier's dependence (2)[a]	Relative power (1)−(2)[b]	Total interdependence (1)+(2)[c]
Strategic	1. Maintain partnership	4.03	3.31	+0.72[d]	7.35
	2. Accept locked-in relationship	4.01	2.68	+1.33[d]	6.69
	3. Terminate relationship	3.70	2.72	+0.98[d]	6.42
Bottleneck	4. Accept dependence	3.66	2.32	+1.34[d]	5.97
	5. Reduce dependence and risk	3.26	2.31	+0.95[d]	5.56
Leverage	6. Exploit buying power	2.41	2.68	−0.27[d]	5.09
	7. Develop a partnership	3.14	3.08	+0.06	6.22
Non-critical	8. Pooling of requirements	1.90	1.97	−0.07	3.88
	9. Individual ordering	1.94	1.79	+0.15	3.73

[a] Supplier's and buyer's dependence are measured by taking the average score on the items of each construct respectively.

[b] Power is measured on a scale from −4 (maximum supplier's dominance) to +4 (maximum buyer's dominance).

[c] Total interdependence is measured on a scale from +2 (minimum interdependence) to +10 (maximum interdependence).

[d] Difference between supplier's dependence and buyer's dependence is significant at $p < .05$.

De Ruyter et al., 2001; Morgan and Hunt, 1994). In contrast, the findings suggest that such satisfactory relationships experience an asymmetric power balance. From the buyer's perspective the supplier dominates the relationship.

Presumably, once a buyer has entered a partnership this ensures a disproportionate raise in the dependence of the buyer on the supplying partner. Cox et al. (2003) give a possible explanation for this phenomenon. In their belief a pre-contractual situation of balanced power shifts to a post-contractual situation of supplier dominance, when the supplier refuses to offer balance in the relationship and locks the buyer in. Our results therefore empirically confirm the belief of Cox et al. (2003). Our findings can also be explained by the notion of Frazier and Antia (1995), 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. In this case the relative power position is used to enhance the nature of relational exchange between trading partners. The distribution of power has become legitimated over time as both parties know what to expect from each other.

4.2. Differences in the power position between purchasing strategies

Gelderman and Van Weele (2003) found that purchasing professionals adhere to two kinds of purchasing strategies in each quadrant. One type of strategy pursues preservation of the current position in the quadrant, while the other type pursues a move to another position. The relative power position of buyers and suppliers is expected to influence the choice of purchasing strategy within each quadrant. Therefore, the question is whether significant differences exist in the relative power position between the strategies that are pursued within each quadrant (hypoth-

eses 1b–9b). Table 9 presents the difference between purchasing strategies within each quadrant. $POWER_i$ refers to the relative power position for the buyer in scenario i. A negative sign shows that supplier dominance in the first scenario is lower than in the second scenario.

All differences in the power situation between quadrants turn out to be significant. This indicates that each purchasing strategy is characterized by a unique power balance between buyers and suppliers.

The findings in Table 9 confirm our prior expectations. Within the strategic quadrant we find the highest level of supplier dominance when the buyer accepts the locked-in relationship (scenario 2). Furthermore, the lowest level of supplier dominance is found in the situation that a strategic partnership is maintained. These results confirm hypotheses 1b–3b. In the bottleneck quadrant the strategy in which the dependence position is accepted and the negative consequences are reduced by keeping safety stocks is associated with the highest supplier domination. This confirms hypotheses 4b and 5b. With respect to the strategies within the leverage quadrant, we find a better power position for the buyer, i.e. a lower supplier dominance, when the buying power is exploited. The development of a strategic partnership means deterioration of the power position of the buyer. This confirms our hypotheses 6b and 7b. Furthermore, the results indicate a better power position for the buyer when purchasing requirements are pooled (scenario 8), than in the case that individual orders are placed (scenario 9). This finding confirms hypotheses 8b and 9b.

4.3. Differences in the total interdependence position between purchasing strategies

The last column of Table 8 shows the level of total interdependence associated with the various purchasing strategies. Several separate tests have been undertaken to

Table 9
Differences with respect to relative power *within* the quadrants of Kraljic matrix

Quadrant in the Kraljic matrix	Purchasing strategies	Results with respect to relative power	
Strategic	Maintain partnership versus accept locked in relationship	$POWER_1$–$POWER_2$	-0.64[a]
	Maintain partnership versus terminate relationship	$POWER_1$–$POWER_3$	-0.27[a]
	Accept locked-in relationship versus terminate partnership	$POWER_2$–$POWER_3$	$+0.37$[a]
Bottleneck	Accept dependence versus reduce dependence and risk	$POWER_4$–$POWER_5$	$+0.38$[a]
Leverage	Exploit buying power versus develop strategic partnership	$POWER_6$–$POWER_7$	-0.36[a]
Non-critical	Pooling of requirements versus individual ordering	$POWER_8$–$POWER_9$	-0.24[a]

[a]Significantly different from zero at $p < .05$.

Table 10
Differences with respect to interdependence *within* the quadrants of Kraljic matrix

Quadrant in the Kraljic matrix	Purchasing strategies	Results with respect to interdependence	
Strategic	Maintain partnership versus accept locked in relationship	$INDEP_1$–$INDEP_2$	$+0.66$[a]
	Maintain partnership versus terminate relationship	$INDEP_1$–$INDEP_3$	$+0.93$[a]
	Accept locked-in relationship versus terminate partnership	$INDEP_2$–$INDEP_3$	$+0.27$[a]
Bottleneck	Accept dependence versus reduce dependence and risk	$INDEP_4$–$INDEP_5$	$+0.41$[a]
Leverage	Exploit buying power versus develop strategic partnership	$INDEP_6$–$INDEP_7$	-1.13[a]
Non-critical	Pooling of requirements versus individual ordering	$INDEP_8$–$INDEP_9$	$+0.15$

[a]Significantly different from zero at $p < .05$.

determine whether total interdependence differs significantly between individual purchasing strategies within each quadrant. The results are reported in Table 10, where $INDEP_i$, refers to total interdependence associated with strategy i.

The results in Table 10 confirm our expectations. Within the strategic quadrant total interdependence is highest when the strategic partnership is maintained (preserve current position), and lowest when buyers pursue a termination of the partnership (change position). In the bottleneck quadrant the highest level of interdependence is associated with an acceptance of the dependence position (preserve current position). The findings for the leverage quadrant suggest that total interdependence is highest when a strategic partnership is developed (change position). For the non-critical quadrant the highest level of interdependence is associated with the strategy in which purchasing requirements are pooled (change position). However, the difference between the two strategies is not significant. This suggests that both strategies can be associated with a similar level of interdependence.

In general, we conclude that our empirical findings confirm the hitherto untested theoretical notions about total interdependence in buyer–supplier relationships.

5. Summary, conclusion and limitations

Kraljic's approach has inspired many academics to undertake further research into purchasing portfolio models. Refined models typically recommended one purchasing strategy for each portfolio quadrant. Gelderman and Van Weele (2003) found that professional purchasers make a clear distinction between alternative strategies *within* each quadrant. The conditions determining the choice for a specific purchasing strategy within a quadrant remain yet unclear, but might very well be associated with differences in power and dependence positions. In this paper, we have empirically quantified the concepts of 'relative power' and 'total interdependence' for each purchasing strategy, using data from a comprehensive survey among Dutch purchasing professionals. This study builds on the case studies of Gelderman and Van Weele (2003) by adding further insights into the power and interdependence structure of the various portfolio-based purchasing strategies.[5] The results of our study prove that there is a significant difference in the power positions between the purchasing strategies *within* each quadrant.

Fig. 3 summarizes the results, showing the relative power positions that are associated with each purchasing strategy. Note that the diagonal line indicates positions in which

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[5]The scope of our research is limited to a view on power and dependence in purchasing from the basis provided by the Kraljic model. This is warranted by the fact that Kraljic's matrix is widely used by purchasing professionals all over the world. Especially in Western Europe the Kraljic approach is adopted at large scale. For example, Bos et al. (2005) reported that in 2004 the portfolio approach was put to use by 61% of Dutch firms. Gradually Kraljic has gained acceptance in other countries as well, notably in the USA, Canada and Northern Europe.
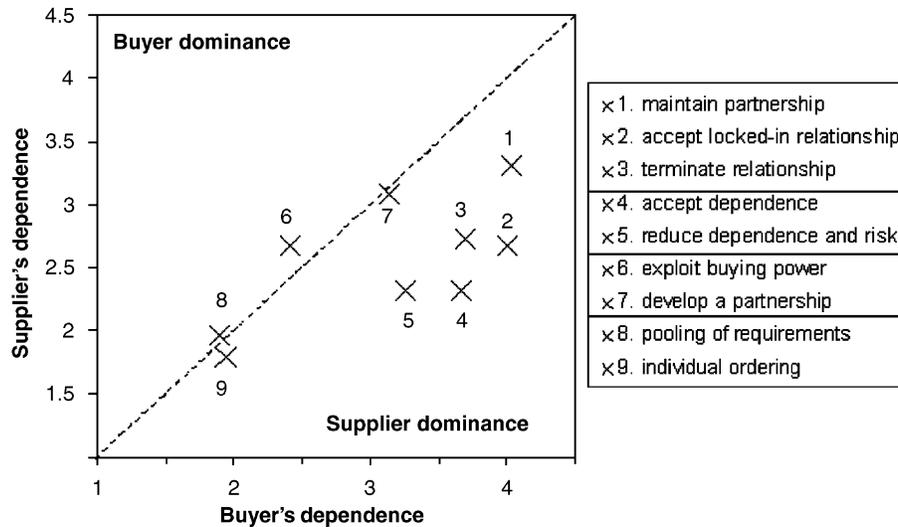
Fig. 3. Power map.

buyer's dependence is equal to supplier's dependence, i.e. it indicates power balance. Strategies on the left-hand side of the diagonal line are characterized by buyer dominance, while strategies on the right-hand side are characterized by supplier dominance. The length of the perpendicular line from each data point towards the diagonal line indicates the size of the power difference between buyers and suppliers.

Comparing strategies aimed at moving towards other positions in the Kraljic matrix (scenarios 3, 5, 7 and 8) with strategies aimed at maintaining the current position (scenarios 1, 2, 4, 6 and 9) leads to the following conclusions. The strategies in the strategic and the bottle-neck quadrant which are aimed at moving (strategies 3 and 5) imply a reduction of the supply risk. Their positions in Fig. 3 indicate that these strategies are pursued in the case that buyer's dependence is relatively low. The level of supplier's dependence seems to be less critical to the choice for these strategies. Furthermore, buyers usually prefer a strategy aimed at maintaining their position in the leverage quadrant of the Kraljic matrix (scenario 6). Our findings suggest that relatively high levels of both buyer's and supplier's dependence constitute conditions for engaging in a partnership (scenario 7) and thereby follow a strategy aimed at moving to another quadrant. Finally, no significant differences were found between scenarios 8 and 9 in the non-critical quadrant. Hence, the levels of buyer's and supplier's dependence do not seem to influence the choice for changing or maintaining the position in this quadrant.

Note that the differences of purchasing strategies in the power map *within* each Kraljic quadrant are smaller than the differences *between* the quadrants. For instance, the strategies in the non-critical quadrant (scenarios 8 and 9) are located closely together in the power map, while the other strategies are at a relatively large distance. Therefore, we can conclude that the levels of buyer's and supplier's

dependence largely determine the position of a purchasing strategy within the Kraljic matrix.

A final conclusion from Fig. 3 is that positions in the bottleneck quadrant and the strategic quadrant of the matrix (scenarios 1–5) are associated with buyer-supplier relationships, which are characterized by supplier dominance. On the other hand, positions in the leverange quadrant and the non-critical quadrant (scenarios 6–9) are perceived to be of a more power-balanced nature. Apparently, from the buyer's perspective the level of supply risk is strongly associated with the perceived power balance between buyer and supplier.

A comparison between our empirical findings and the theoretical expectations generate the following conclusions (see also Appendix B). All hypotheses regarding the power balance associated with each purchasing strategy within the quadrants (1a–9a) were confirmed, except hypothesis 1a. That is, we observed supplier dominance in the strategic quadrant when a strategic relationship is maintained (scenario 1), where one would expect a balanced power situation on basis of the literature. This provocative result sheds new light on the buyer's view on issues of power and dependence. It indicates that a relationship which is characterized by a high involvement of buyers and suppliers does not necessarily imply a balanced power position between the parties, but can yet be satisfactory, at least from the point of view of the buyer. All hypotheses concerning the relative power positions of the different strategies within each quadrant (1b–9b) and the level of total interdependence (1c–9c) were confirmed.

Despite the rigor of our analysis, our study contains several limitations that might entice further research. One of the limitations concerns the sample, which was drawn from a list of members of the Dutch Association of Purchasing Management (NEVI). Although our sample included a wide range of industry sectors, the general-izability of the results would benefit from the inclusion of

Table 11
Description of the scenarios corresponding to the purchasing strategies

Quadrant in the Kraljic matrix	Purchasing strategy/ scenario	Scenario description
Strategic	1. Maintain a strategic partnership	Consider a product with a high supply risk and a high financial value. You consider the supplier as an important partner with whom a satisfactory, cooperative 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. Accept a locked-in partnership	Consider a product with a high supply risk and a high financial value. The relationship with the supplier leaves much to be desired. Earlier your company was to a large extent forced to do business with that supplier. Now, your company has to put up with the supplier and tries to make the best of the involuntary relationship with the supplier.
	3. Terminate a partnership, find a new supplier	Consider a product with a high supply risk and a high financial value. It is expected that the supplier behaves as a strategic partner. However, the relationship leaves much to be desired. Your company feels that the behavior of he supplier cannot be controlled. It is decided to search for another supplier with whom the company has to build up a new relationship. It is clear that this will be a difficult and challenging task.
Bottleneck	4. Accept dependence, reduce the negative consequences	Consider a product with a low financial value, but a high supply risk. Your company is vulnerable regarding the supply of the (single) supplier. Assurance of supply is pursued by keeping high safety stocks.
	5. Reduce dependence and risk, find other solutions	Consider a product with a low financial value, but a high supply risk. Your company is vulnerable regarding the supply of the (single) supplier. In response to this situation, it is decided to search for other solutions, especially by working with more generic specifications, if necessary finding another supplier.
Leverage	6. Exploit buying power	Consider a product with a high financial value, but a low supply risk. Negotiations are tough in pursuit of the lowest price, guaranteed quality and reliable delivery. Competitive bidding is an option. You are only willing to enter short-term contracts.
	7. Develop a strategic partnership	Consider a product with a high financial value, but a low supply risk. You recognize possibilities for deepening the relationship with the supplier, allowing him to contribute more to the competitive position of your company. It is expected that the supplier will behave as a partner and will place his technological experience and knowledge at the service of your company.
Non-critical	8. Pooling of requirements	Consider a product that has a low financial value and a low supply risk. The product is not very critical for your company. It is decided to buy the product as a part of a package of similar products from a certain supplier. By pooling of requirements, a single supplier can be contracted for a package of items.
	9. Individual ordering	Consider a product that has a low financial value and a low supply risk. Every time the product is needed in the company, a single order is placed with a supplier.

Table 12
Comparison of power and interdependence for purchasing strategies within each Kraljic quadrant: theory and practice

Quadrant in the Kraljic matrix	Purchasing strategy/ scenario	Relative power		Power position within quadrant		Total interdependence within quadrant	
		Expected	Observed	Expected	Observed	Expected	Observed
Strategic	1. Maintain partnership	Balanced	Supplier dominance	Worst for the supplier	Worst for the supplier	Highest	Highest
	2. Accept locked-in relationship	Supplier dominance	Supplier dominance	Best for the supplier	Best for the supplier	Moderate	Moderate
	3. Terminate relationship	Supplier dominance	Supplier dominance	Moderate for the supplier	Moderate for the supplier	Lowest	Lowest
Bottleneck	4. Accept dependence	Supplier dominance	Supplier dominance	Best for the supplier	Best for the supplier	Highest	Highest
	5. Reduce dependence and risk	Supplier dominance	Supplier dominance	Worst for the supplier	Worst for the supplier	Lowest	Lowest
Leverage	6. Exploit buying power	Balanced	Balanced	Best for the buyer	Best for the buyer	Lowest	Lowest
	7. Develop a partnership	Balanced	Balanced	Worst for the buyer	Worst for the buyer	Highest	Highest
Non-critical	8. Pooling of requirements	Balanced	Balanced	Best for the buyer	Best for the buyer	Highest	No significant difference
	9. Individual ordering	Balanced	Balanced	Worst for the buyer	Worst for the buyer	Lowest	No significant difference

firms in the service sector, as well as other Dutch and international companies. This might be the object of a further study.

Another limitation concerns the fact that the survey was confined to the perspective of the buyer. Yet, buyer–supplier relationships are dyadic in nature. Suppliers might have different opinions on the power and interdependence structure of the various buyer–supplier relationships. Therefore, there is a need to more fully study the supplier's perspective in order to establish whether or not both parties perceive each other's power position in the relationship in the same way. In addition, further research should take a more holistic supply chain perspective on buyer–supplier relationships and acknowledge the possible influence of critical external forces, such as regulation, standards and international trade barriers.

Appendix A

For the description of the scenarios corresponding to the purchasing strategies see Table 11.

Appendix B

For the comparison of power and interdependence for purchasing strategies within each Kraljic quadrant: theory and practice see Table 12.

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