The buyer-supplier relationship quality impact on supply risk through the lens of buyer-supplier interdependence

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Abstract

The supply chain literature identifies relationship quality (RQ) as a key concept that firms should consider in their relationship with partners. However, the literature lacks insights on how RQ can help reducing supply-side risk. The present study empirically examines the impact of RQ on supply risk using interdependence matrix. Data from a survey of 143 Iranian manufacturing firms are employed to test the hypotheses using multivariate regression and cluster analyses. We found some complex sets of relationships between RQ and supply risk based on the level of interdependence between buyers and suppliers, which presents important implication for theory and practice.

Keywords: Buyer-Supplier Interdependence, Supply Risk, Relationship Quality

Introduction

Supplier's failure to meet the buyer's quality specifications or to deliver goods or services is a well-documented risk with proven detrimental effect on buyer performance and loyalty as well as downstream supply chain activities (Zsidisin et al., 2004). Building a long-term relationship with suppliers can be considered as a useful tool to manage and reduce potential supply risk (Spekman & Davis, 2004, Wagner & Bode, 2008) by increasing the sense of unity and consequently decreasing opportunism between partners through creating trust and commitment in their relationship. Over the last few years, relationship quality (RQ) in business-to-business relationships is considered as an important area of academic inquiry. Despite a large body of research on relationship quality concept (Emberson & Storey, 2006), only limited numbers of studies have addressed the potential association between buyer-supplier relationship quality and supply risk (e.g. Caniels & Gelderman, 2005, Caniels & Gelderman, 2007). Furthermore,

the literature highlights the importance of inter-firm dependency and its influence on supply risk as perceived by the buyer (Doney & Cannon, 1997; Handfield & Bechtel, 2002; Caniels & Gelderman, 2007), which presents a new angle to extend the research on the relationship between RQ and SR.

In the upstream supply chain context, single sourcing is argued to be as one of the main risk elements (Tang and Musa, 2011) which can result in amplifying the level of buyers' dependence on their suppliers. In fact, partners involved in dyadic relationships can experience different levels of dependency. In symmetrical interdependence the level of dependency in both parties is equal. However, in interdependence asymmetry, it is likely that one of the parties dominates the other. In such a state of relationship imposing exertion of power by the dominant partner can make the relationship deficient (Caniels & Gelderman, 2007). At a high level of interdependence (i.e. total interdependence), however, parties will have fewer conflicts and consequently greater trust and commitment among them (Kumar et al., 1995; Caniels & Gelderman, 2005). Mutual dependence can enhance mutual trust between partners by increasing personal interactions, information sharing, and resource integration (Gao et al., 2005). Hallikas (2005) suggests that in situations with a captive buyer or where mutual independence exists in relationships, supply risk will escalate.

The above background leads to the argument that relationship quality will be a key factor and of considerable importance for managing supply risk. We argue that high levels of relationship quality between buyers and suppliers can facilitate firms to improve their management of supply risk, largely stemming from asymmetrical interdependence. In attending this subject, we first classify firms in our samples into four clusters based on their interdependence with their key supplier. This is followed by exploring the level of trust and commitment, as two dimensions of buyer-supplier relationship quality, in each cluster and use it to investigate the effect of relationship quality dimensions on supply risk. Finally, drawing on interdependence matrix, we re-examine the associations between relationship quality dimensions (trust and commitment) and supply risk in different clusters. The following section reviews the literature on interdependence theory, buyer-supplier relationship, and supply risk, and lays the foundation for the hypotheses to be tested. Subsequent sections describe the research methodology, analysis, and implications.

Literature review and hypotheses development

Relationship quality

Several definitions for buyer-supplier relationship quality are highlighted in the literature in which the following are the most cited in previous studies: the appropriateness of the relationship in order to meet the customers' needs (Roberts et al., 2003); development of a long-term relationship between supply chain parties to create the value (Fynes et al., 2004); and making a strong relationship with customers and converting them to the loyal customers (Rauyruen & Miller, 2007). The "relationship quality", in general, can be considered as the level of satisfaction of each party (buyer/supplier) in their dyadic relationships. In the pertinent literature, relationship quality is usually considered as a multidimensional construct including trust and commitment (e.g. Friman et al., 2002; Farrelly and Quester, 2005; and Huntley, 2006). Trust and commitment between the supply chain partners are the key factors in evaluating successful relationship in marketing which can improve the performance, effectiveness, and productivity of activities in supply chain relationships (Morgan & Hunt, 1994). Trust and commitment in the buyer and supplier relationship are also suggested to be one of the main factors in

firms' opportunistic behavior (Morgan and Hunt, 1994; Spekman and Davis, 2004; Faisal et al., 2006).

Roberts et al. (2003) have introduced trust as the level of assurance to the business partner that leads to efficiency, effectiveness, and risk reduction. This factor is derived from the relationship marketing literature and demonstrates the belief, attitudes and honest behavior, and is based on three aspects including benevolence in partner's activities, honesty, and acting in the interests of both parties involving in the relationship (Walter et al., 2003). In other words, trust can be defined as the firms' tendency to develop a stable relationship (Van Bruggen et al.,2005) which can positively affect the cost and value of the transaction (Skarmeas et al., 2008), and create the sense of safety and loyalty in the relationship (Rauyruen & Mille, 2007). This can be expected to lead to lower risk in supply of the agreed good or service.

Similarly, commitment works for establishing and maintaining a long-term relationship (Walter et al., 2003; Rauyruen & Miller, 2007), which in practice means positive attitudes towards a future relationship and investment on it (Walter et al., 2003). The commitment in the relationship between supplier and buyer thus represents the sense of unity in the relationship which arises from dependence of the parties on each other and subsequently the spirit of unselfishness. Firms in such a state endeavor to maintain their relationships with their partners and do not wish to terminate these kind of relationships even if there are other alternative counterparties (Skarmeas et al., 2008).

Buyer-supplier interdependence and its role in relationship quality

Ramsay (1996) defined power as the sense of dependency in buyer and supplier to each other which is due to the attractiveness of each party's resources and the availability of a substitute for the counterparty. Kim (2000) described the power as the ability of firms to influence beliefs, attitudes, and behavior of their partners. Two properties of magnitude and asymmetry are discussed in the literature for the power construct (Kumar et al., 1995). While the magnitude is the sum of buyer power and supplier power, the asymmetry is calculated by subtracting them (Kim, 2000). In addition, Caniels & Gelderman (2005) define the power as how much each party depends on the trading partner. Based on the dependency level, this approach creates two states of the balanced and imbalanced relationship. In the balanced or symmetrical interdependence situation, both buyer and supplier present a similar level of dependency in their relationship (Kumar et al., 1995), and in the imbalanced situation, there is asymmetry in their dependency reflecting the dominance of one of them in their partnership (Caniels & Gelderman, 2005). Interdependence situation exists when one of the partners do not control the desired outcome completely (Handfield & Bechtel, 2002; Sambasivan et al., 2013). Based on the nature of interdependence, dyadic buyer-supplier relationship according to their dependency can be categorized into four groups namely as: strategic, non-strategic, supplier dominance, and buyer dominance (e.g. Cox, 2001). In strategic group both buyer and supplier are interdependent. In contrast, the non-strategic group indicates a situation where both buyer and supplier are independent. The supplier dominance group presents a situation where the supplier has power over the buyer. Finally, buyer dominance group addresses a situation with the powerful buyer and captive supplier.

A limited number of studies have examined the effect of buyer-supplier interdependence on the quality of their relationships (e.g. Kumar et al., 1995; Van Bruggen, 2005; Gao et al., 2005). High levels of interdependence create mutual trust in a relationship resulting in the formation of long-term relationships between supply chain parties which in turn can reduce switching cost (Doney & Cannon, 1997; Berthon et al.,

2003). In this situation, commitment and cooperation between partners are well improved (Berthon et al., 2003), both partners are willing to continue their relationship (Provan, 1993; Caniels & Gelderman, 2007), and levels of their opportunistic behavior are decreased significantly (Provan, 1993). Sambasivan et al. (2013) suggest the relational capital (RC) as a critical factor in strategic alliances in a supply chain and claim a considerable association between RC and quality of the relationship between partners. They introduced trust, commitment, and communication as three dimensions of relational capital and examined the impact of interdependence on these three factors. From their standpoint interdependence can create benefit for both parties, build a long-term relationship, and improve information sharing, mutual trust, and commitment (Sambasivan et al., 2013). On the other hand, in asymmetrical dependence, the level of trust decreases because of the greater opportunism in a dominant party (Handfield & Bechtel, 2002). In dealing with the powerful supplier the number of alternatives is low, therefore a buyer firm has less trust in its partner because of the sense of vulnerability in finding substitute suppliers (Handfield & Bechtel, 2002). In a relationship based on greater interdependence asymmetry, more conflicts may happen and levels of trust and commitment can be fallen significantly (Kumar et al., 1995). The existence of asymmetrical interdependence in buyer and supplier relationship can cause unproductive partnership and destruction in their relationship in a long term as the inequality in the level of power can lead to an increase in their conflicts (Caniels & Gelderman, 2007) and consequently reducing levels of their cooperation (Caniels & Gelderman, 2007; Kim et al, 2010). The reasoning leads to our first set of hypotheses:

H_1. Trust is highest in the "strategic" cluster, lowest in the "non-Strategic" cluster, and at intermediate levels in the "supplier dominance" cluster and "buyer dominance" cluster.
H_2. Commitment is highest in the "strategic" cluster, lowest in the "non-Strategic" cluster, and at intermediate levels in the "supplier dominance" cluster and "buyer dominance" cluster.

Supply risk and the role of buyer-supplier interdependence

The risk in the supply chain can be classified into three categories of demand, supply, and process risk based on the variation in the flow of goods (Chen et al., 2013). Supply risk is the risk of suppliers' default to fulfill their obligations in term of time, quality and quantity of product and their inability to meet customer's needs. Demand risk addresses the difference in forecasted and actual demand and comes from the uncertainty in demand. Process risk is related to the inability of the manufacturer in terms of time, quality and quantity in the production process (Chen et al., 2013).

In the non-strategic cluster with a high level of independence, the opportunistic behavior emerges in both buyer and supplier in the relationship (Provan, 1993) which is one of the main sources of supply risk (Wagner & Bode, 2008). In the supplier dominance cluster, while the supplier feels independent, the buyer experiences the powerless situation. In this scenario, the suppliers sense the buyers' limitation in finding alternatives and also buyers confronts high levels of switching cost. Thus suppliers may not respond to the buyers' order at the right time (Handfield & Bechtel, 2002) which increase supply risk perceived by the buyer. In a situation with a low level of supply risk and high profit impact the level of buyer's dependence is relatively low (Caniels & Gelderman, 2007). This leads us to conclude that in buyer dominance cluster which the buyer has control over the dependent supplier, the levels of supply risk may reduce considerably. In the strategic cluster, in which buyer and supplier are interdependent, the level of conflict in their relationship will be less than other clusters with lower interdependency and greater

asymmetry (Kumar et al., 1995). Also, high level of total interdependence indicates a long-term relationship between partners (Caniels & Gelderman, 2005) which can reduce stress and risk for the buyer (Van Bruggen et al., 2005). This leads to the following hypothesis:

H_3. Supply risk is highest in the "Non-Strategic" and "supplier dominance" clusters and lowest in the "Strategic" and "buyer dominance" clusters.

The role of buyer-supplier relationship quality on supply risk

Investing in supplier relationship can minimize the risk (Handfield & Bechtel, 2002). In fact, the existence of the single source for supplying goods increases the supply risk for the buyer. In this case, the buyer can reduce this risk by establishing a relationship based on mutual trust and commitment (Caniels & Gelderman, 2007). In a high level of interdependency, the level of trust and commitment between supply chain parties will be high which can cause a reduction in supply risk for the buyer company by improving product quality, delivery reliability, lead times, product development, and product design (Caniels & Gelderman, 2005). Therefore the next set of hypotheses can be formulated as:

H_{4a}.Trust has a negative effect on supply risk
H_{4b}. Commitment has a negative effect on supply risk
H_{5a}. Trust has a negative effect on supply risk in each cluster of non-strategic, supplier dominance, buyer dominance, and strategic.
H_{5b}. Commitment has a negative effect on supply risk in each cluster of non-strategic, supplier dominance, buyer dominance, and strategic.

Methodology

Data collection

Survey data have been collected from Iranian manufacturers in various sectors containing high, medium-high, medium-low, and low-tech industries. To reduce concern about the face validity the questionnaire was translated from English to Persian and again to English by the professional translators. It should be noted that a seven-point Likert scale (from extremely agree to extremely disagree) was used for all items of the research questionnaire. The questionnaires were addressed to senior managers or directors in charge of supply chain issues. To collect the data, 700 manufacturing firms were selected randomly and then the questionnaires were sent to them via email. They were asked to answer the questionnaire based on their relationship with the key supplier. As a result, 143 usable responses were collected.

Variable measurement

We utilized eight-item scales from the study of Skarmeas et al. (2008) to measure trust and commitment as two dimensions of buyer-supplier relationship quality. Trust reflects the supplier's honesty and reliability to the relationship and his obligations, and commitment aims to measure the sense of unity and strength in the relationship with the supplier. Six items were developed by Kumar et al. (1995) to assess buyer and supplier dependence. The first three questions focus on the supplier dependence with measuring the perceived supplier's difficulty to replace the sales and profits realized from the existing customer. The next three questions demonstrate the buyer's dependence though finding his ability to replace the supplier with alternatives. The study measured supply risk with a six-item scale from Chen et al. (2013). These six items were used to measure

the supplier's capability to meet the buyer's requirements in terms of time, quality, and volume.

Analysis

Reliability, validity, and descriptive statistics

Confirmatory factor analysis (CFA) was employed using LISREL 8.8 to refine the research measurements. Item loadings less than the cut of point 0.5 (C2=0.33, BD1=0.31) were removed to improve the fit indices. Table 1 explains factor loadings, composite reliabilities (CRs), average variances extracted (AVE), and Cronbach's alpha for each multi-item construct. The fit indices verified the model to fit the data quite well with $X^2 = 239.06$, *df* = 125, CFI = 0.97, IFI = 0.97, and RMSEA= 0.080. To test and validity and reliability of the measurement we employed Cronbach's alpha, the composite reliability (CR) and average variances extracted (AVE). The cut off points 0.6 for Cronbach's alpha, 0.7 for CR, and 0.5 for AVE (see Hair et al. (2010)) were exceeded by all constructs in the study.

Table 1- Summary of statistical measurement analysis

Latent Variables	α	Loading	CR	AVE
Trust	0.83	0.57-0.85	0.84	0.57
Commitment	0.81	0.59-0.90	0.84	0.64
Supplier dependence	0.81	0.63-0.98	0.82	0.62
Buyer dependence	0.86	0.79-0.96	0.87	0.77
Supply risk	0.93	0.72-0.89	0.93	0.69

*Item loadings after deleting values less than 0.5

Results

The cluster analysis was employed to study buyer and supplier dependence through the matrix structure. To find the number of clusters hierarchical cluster analysis was utilized. As suggested by Lehmann's (1979) the number of clusters should be between (n/30) and (n/60), whereas *n* represents the sample size, thus, the suitable number of clusters for our sample (143) should be between two to four clusters. As Table 2 presents, the agglomeration coefficient increases significantly moving from stage s140 to 141 (5.46 versus 7.80). Also, the movements between stages 140 to 141 had the largest increases in heterogeneity (42.93%). Thus, these results indicate that three clusters are enough to describe our sample. To generate three clusters, K-mean cluster analysis was conducted. Figure 1 presents the classified samples based on the level of buyer and supplier dependency in three clusters of strategic, asymmetric and non-strategic. It should be noted that in hierarchical clustering analysis, four clusters were normally anticipated based on the nature of interdependency concept (see e.g., Cox, 2001). However, in line with previous studies (i.e. Hallikas et al., 2005), we obtained three clusters in our sample and the powerful buyers were not included in our samples. We conducted ANOVA to test differences among the three clusters. The F-values show that the three clusters significantly differ from each other in buyer dependence and supplier dependence (126.556 and 121.157 respectively, $p< 0.01$). The non-strategic cluster with 62 members represents a low level of dependence in both buyer and supplier. In this cluster, high level of conflicts and low cooperation can be anticipated in the relationship between partners, which in turn can cause the low level of trust and commitment between them. The second cluster containing 45 members demonstrates the high level of buyer dependence and

supplier independence. The strategic cluster with 36 members shows a high level of mutual dependence in partners. Partners in this cluster have a high-quality relationship based on mutual trust and commitment.

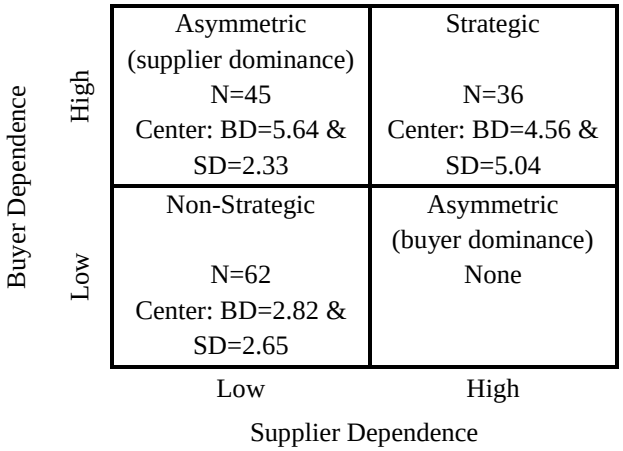

Figure 1- Classification of Buyer-Supplier Interdependence

Table 2- Agglomeration Schedule

Stage	Cluster	Combined with cluster:	Coefficient	Number of clusters after combining	Differences	Percent Change in Heterogeneity
139	3	91	3.94	4	1.52	38.45
140	3	6	5.46	3	2.34	42.93
141	2	3	7.80	2	-0.88	-11.23
142	1	2	6.93	1		

ANOVA was carried out to investigate the level of relationship quality and supply risk among buyer-supplier dependence clusters. Table 3 shows the results of the hypotheses 1, 2 and 3. The statistical analysis shows a significant difference of trust among three clusters. As it can be seen in Table 3 the level of trust between buyer and supplier is highest in a cluster with the strategic relationship between partners (mean=5.35), and lowest in the non-strategic cluster (mean=4.30), which supports H_1. Furthermore, the level of commitment is lowest in the non-strategic cluster (4.17), while its value in the asymmetric cluster is greater that strategic cluster. Therefore, the H_2 is partially accepted. Moreover, the supply risk in the non-strategic cluster is higher than other clusters (mean=3.34). However, supply risk in a cluster with supplier dominance is relatively low. Also, there is no significant difference in supply risk among second and third clusters. Therefore, although the level of supply risk differs in three clusters, the H_3 is rejected.

Due to the small sample size across clusters, we used power analysis in our multivariate regression suggested by Hair et al. (2010). As Table 4 presents, considering a whole sample, trust is negatively associated with supply risk (dependent variable), thus H_{4a} is supported (-4.538, $p<0.01$). Similarly, the relationship between commitment and supply risk is negative and significant, which supports H_{4b} (-3.561, $p<0.01$).

Moreover, trust shows negative and significant associations with supply risk in all three clusters, supporting H5a (-2.358, $p <0.05$; -3.199, $p <0.01$; v-2.471, $p <0.05$). Finally, while there is a negative and significant relationship between commitment and supply risk in cluster one and two (-2.30, $p <0.05$; -2.473, $p <0.05$), there is no significant association between them in cluster three (-1.019, $p>0.05$), thus H_{5b} is partially supported. This result can be justified as in the strategic relationship between partners, the role of

supplier commitment in doing its obligations is dimmed. In fact, in samples with supplier dominance or independent partners existing relationship based on trust and commitment can mitigate the supply risk. Table 4 shows the summary of the results.

Table 3- Buyer-Supplier Dependence and Consequence Variables: ANOVA

Consequence Variables	Clusters			F-value	Sig
	Cluster 1 Non-Strategic	Cluster 2 Asymmetric	Cluster 3 Strategic		
Trust (Mean)	4.30 (2*, 3*)	4.98 (1*)	5.01 (1*)	5.35	.006
S.E.	.16	.19	.20		
Commitment (Mean)	4.17 (2*, 3*)	5.29 (1*)	5.11 (1*)	12.16	.000
S.E.	.16	.20	.20		
Supply risk (Mean)	3.34 (2*)	2.78 (1*)	2.81	3.20	.044
S.E.	.18	.20	.17		

Numbers in parentheses are the target clusters which their mean difference with the focal cluster is significant at 0.05

Table 4- Regression Results

Variables	Total	Cluster 1	Cluster 2	Cluster 3
Trust	0.000(-4.538)	0.022(-2.358)	0.003(-3.199)	0.019(-2.471)
Commitment	0.001(-3.561)	0.025(-2.300)	0.018(-2.473)	0.316(-1.019)
R^2	0.457	0.399	0.520	0.408
F-Value	58.863	19.554	22.718	11.374
Sig	0.000	0.000	0.000	0.000
Durbin-Watson	2.182	2.267	1.802	2.430

T-values are in parentheses; *P<0.05.

Discussion and conclusion

While most of the previous studies on buyer-supplier interdependence subject are focused on bargaining power and purchasing strategies (see e.g., Caniels & Gelderman, 2005; Caniels & Gelderman, 2007), our study explores its effect on supply risk. Previous studies presented a risk-based classification of relationships. However, the role of buyer-supplier relationship quality on the risk of supply through the lens of dependence theory has not been studied empirically. Also, investigating the quality of supply chain parties' relationship gives the buyer firms better insight into his future potential risk associated with the supplier. Because in a relationship based on the lack of trust and commitment, partners' tendency to conduct opportunistic behaviors will increase, which leads them to do not fulfill their obligations and increase risk. As the level of supply risk depends on the level of power, companies can anticipate their potential supply risk by investigating their position in buyer-supplier dependence matrix. Also, due to the effect of relationship quality on mitigating supply risk, considering companies' position in the matrix, they can improve their relations with suppliers to decrease their risk from the supply side. The contribution of this study is expanding the existing literature in buyer-supplier relationship quality, interdependency, and supply risk. Our findings provide a reliable framework to deal with supply risk considering the nature and quality of their relationships with business partners.

In this research, considering the nature of interdependence theory (Cox, 2001), we investigated the classification of supply chain parties' power. The levels of trust, commitment, and supply risk have been studied across the obtained clusters. Also, following the suggestion of previous studies (See e.g. Caniels & Gelderman, 2005;

Caniels & Gelderman, 2007) we examined the impact of trust and commitment on supply risk perceived by the buyer. In our classification we had three clusters consist of the non-strategic, asymmetric, and strategic cluster. In the non-strategic cluster, the mutual dependency was low and we had the minimum trust and commitment between partners and supply risk was highest. In the asymmetric cluster, we had a captive buyer while the level of trust was medium. However, statistical analysis shows the highest amount of commitment and medium range of supply risk in this cluster. In the strategic cluster, results depict the highest level of trust and commitment and the lowest level of supply risk whereas the level of commitment and supply risk was medium. Also in the result of multivariate regression, the result indicates the negative effect of trust and commitment on supply risk in general (whole sample). Trust, regardless of the supplier and buyer interdependence level, in each cluster has a negative effect on supply risk. However, in the strategic cluster, the negative impact of commitment on supply risk was surprisingly not supported and needs further investigation which can be addressed in future research.

While our study presents several important contributions, its limitations require future research. The economic instability in Iran through the period of undertaking this research might affect the results, especially with regards to the level of dependency between partners. The study was conducted in Iranian manufacturing firms which may limit the generalizability of the findings. Therefore, extending the study to other regions can be the potential research area for future studies. In addition, a common method bias might be a concern in our study as we collected data for dependent and independent variables from a single informant. Finally, examining the impact of other prerequisites in mitigating supply-side risk through the lens of interdependence theory can be targeted for future research.

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