The Effects Of Environmental Uncertainty And Search Costs On Relational Norms In Interfirm Relationships

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ABSTRACT

Many firms use network perspectives in the context of interfirm relationships, an approach that is causing a rapid change in industrial dynamics. However, although most firms are connected with exchange partners, it is difficult to have positive relationships because of the latter is opportunistic behavior. This study considers the factor of industrial dynamics in interfirm relationships. Thus, we investigate the moderation effect of network embeddedness in relational norms on environmental uncertainty and search costs regarding interfirm relationships. Specifically, we identify network relationships and focus on changes of network norms in a focal firm and its exchange partners. Consequently, this study offers several theoretical and managerial implications, and suggests areas of future research regarding interfirm relationships.

Keywords: Environmental Uncertainty; Search Cost; Relational Norm; Network Embeddedness; Interfirm Relationship

INTRODUCTION

*I*n the industry marketplace, there are many volatile network and information systems that cross-organizational boundaries. These systems try to introduce competitive advantage between suppliers and buyers in the context of interfirm relationships (Barney, 2012; Jeon & Ha, 2015; Ko & Smith, 2016).

Recently, individual buyer–seller, or interfirm, relationships have come to be regarded as embedded in relational networks (Welch & Wilkinson, 2005). Studies have considered the subsequent dyadic relationships from network perspectives. However, most firms are connected with exchange partners in a network; thus, it is hard to determine relationships in terms of industrial dynamics because of uncertainty and transaction costs (Bakos, 1997; Hoque & Lohse, 1999; Lee, 2002; Qi, Zhao & She, 2011; Lo & Shiah, 2016; Nishida & Remer, 2016). Thus, network embeddedness is the most important factor in interfirm relationships.

Network embeddedness refers to social relationships in networks generated by interfirm members. Social resources embedded in networks may provide various benefits to firms (Emmerik & Sanders, 2004). According to the literature, network structures and relationships are important factors for financial goals and the encourage firm value (Tsai & Ghoshal, 1998; Tsai, 2000).

Traditionally, channel theory focused only on governance relationships among parties in marketing channels. Moreover, only a few studies have considered relationships in terms of industrial dynamics (Antonelli, 2012; Carlsson, 2012). In this current study, we investigate environmental uncertainty and search costs, which are factors of industrial dynamics, instead of limiting our context to channel theory.

Thus, from a network perspective, this study focuses on environmental uncertainty and search costs among channel members and demonstrates the effect of two factors on relational norms.

THEORETICAL BACKGROUND

Environmental Uncertainty

Some scholars have addressed the effectiveness of organizational relationships that depend upon the fit between external environmental components and a firm's internal resources (Neu & Brown, 2005; Lo & Shiah, 2016). In such research, according to contingency theory, environmental uncertainty is a crucial factor for interfirm management strategies (Lee, 2002; Qi et al., 2011; Lo & Shiah, 2016).

Environmental uncertainty refers to the inability to predict changes in relevant factors surrounding suppliers' exchanges (Walker & Weber, 1987; Artz & Brush, 2000). In this regard, when environmental uncertainty increases, expectations such as the development of future supply requirements also increase in the gap between goals and performance (Artz & Brush, 2000).

In addition, suppliers are likely to insist on negotiating agreements that account for price uncertainty and the inability to predict demand for products (Walker & Weber, 1987; Crocker & Masten, 1991). Such a requirement makes it more difficult for suppliers to negotiate contracts. Consequently, suppliers may spend significant time and effort on detailed contracts because of unfavorable environmental changes (Walker & Weber, 1987; Artz & Brush, 2000). Similarly, some studies have argued that environmental uncertainty comes from a lack of clear understanding of the situations that firms encounter. Such uncertainty occurs when parties perceive that their environment, or one of its factors, is unpredictable in the market (Duncan, 1972; Milliken, 1987; Lo & Shiah, 2016). Other studies have addressed the issue that environmental uncertainty is created by the perceived rate of changes and the ability to understand causes and relationships (Dean & Sharfman, 1993; Priem, Rasheed & Kotulic, 1995; Boyd & Fulk, 1996; Lee, Ha & Kim, 2014; Yu, Wang, & Brouthers, 2016). Specifically, Yu, Wang, and Brouthers (2016) theorized that perceived environmental uncertainty affects a firm's willingness and ability to identify parties. Consequently, higher environmental uncertainty occurs in the market and the more straitened firms try to minimize resource commitments regarding money, time, and effort.

In order to identify each partner, firms should acquire interfirm relationships through network embeddedness, cooperation, and trust when under conditions of environmental uncertainty (Birnberg, 1998; Poppo & Zenger, 2002; Lim, Smith, & Kim, 2014; Min, Kwak, & Lee, 2015). For example, when environmental uncertainty increases the exchange parties' potential for opportunism, it is hard to control and anticipate market demand because of the changing external environment (Birnberg, 1998; Poppo & Zenger, 2002). In this situation, environmental uncertainty should be positively affected by exchange partners' opportunism and negatively influenced by exchange partners' benevolence (Birnberg, 1998; Poppo & Zenger, 2002; Lim et al. 2014).

Moreover, environmental uncertainty allows each exchange partner to act candidly in its own interest and take advantage of an uncertain situation (Klein, Frazier & Roth, 1990; Min et al. 2015). When an exchange partner does not trust its business associates because of a lack of honesty, flexible behavior is difficult because the exchange partner does not believe the information that a firm provides. From this perspective, when a firm has perceived honesty is low, there is no relationship with exchange partners (Min et al. 2015).

In this study, environmental uncertainty is defined as a core factor of interfirm relationships in networks. Thus, it directly influences the relational norm that is related to information sharing and flexibility in interfirm relationships.

Search Costs

Interfirm suppliers must decide how much time to allocate when searching for their partners, which means that they must decide on the amount of time to spend on each search source (Smith, Venkatraman & Dholakia, 1999). In the B2B industry, cost plays an important role in evaluating partners in order to improve financial performance. From this perspective, firms seek the most cost-effective suppliers in terms of assets, time, and effort (Subramaniam & Shaw, 2002). Further, search behavior costs are affected by external factors such as income levels and urgency ratings, and influenced by internal factors (Duncan & Olshavsky, 1982; Punj & Staelin, 1983).

Smith et al. (1999) established that search costs consist of search levels, search sources, search patterns, and search products from a buyer's perspective. From a psychology perspective, a high-knowledge buyer is able to obtain more information if external search costs are favorable in terms of search levels; however, a low-knowledge buyer struggles to find information at the external search level. In a search pattern, a high-knowledge buyer employs cognitive behavior through various search strategies and patterns based on within-brand patterns; however, a low-knowledge buyer lacks this type of behavior and processing (Smith, et al. 1999).

In a differentiated market, there are search cost models not only from a psychology perspective but also from a B2B strategy perspective (Bakos, 1997; Hoque & Lohse, 1999; Nishida & Remer, 2016). Bakos (1997) investigated the reduction of buyer search costs in electronic markets. In this regard, partners of firms are required to pay a search cost to find locations, product characteristics, and network members. In addition, the price offered by some sellers or members determines whether a buyer purchases from one of the parties already identified or keeps searching (Bakos, 1997).

In this current study, because search costs can be measured by a firm's competitiveness and income (Anderson & Oliver, 1987; Cravens, Ship & Cravens, 1993), we define such costs as the core of competitiveness, which decreases because of wasted money, time, and effort. Thus, competitiveness directly affects the relational norm, which is related to information sharing and flexibility in interfirm relationships.

Network Embeddedness

Network theory has been the dominant feature in interfirm relationships that explains the relationships' transactions. It also provides intensive insights that act as perspectives of the multiple players that comprise marketing channels. Besides, network theory has considered large numbers of phenomena through interfirm relationships (Lee & Kim, 2014).

Network relationship literature addresses the positive effects of interfirm network management on performance (Provan Fish & Sydow, 2007). Firms' performance is buffered by network relationships related to instabilities in political, economic, and product demands, and compensates for environmental uncertainty.

A different perspective on the relationship between inter-organizational networks and performance is analyzed by the structural network position of organizations in terms of explaining performance (Galaskiewiez, 1985; Mizruchi, 1987; Knoke, 1990; Burt, 1992; Provan et al. 2007). In particular, embeddedness, which is one of the key factors in network relationships, is a concept that seeks to strengthen a relationship through trust and reciprocity from a long-term perspective and does not seek short-term economic profits from a narrow perspective (Lee & Kim, 2014). Granovetter (1985) argued that stronger embeddedness of economic transactions in broader patterns of social relationships among organizations inhibits the opportunistic behavior of such organizations. More generally, networks that contain many such embedded relationships are dense. Thus, network embeddedness is a key feature of this perspective. Moreover, organizational networks affect important factors of exchange that differ from the logic of the market (Granovetter, 1985).

From this perspective, the embeddedness relationship in a social network can be divided into relational embeddedness and structural embeddedness (Granovetter, 1992; Jones, Hesterly & Boragatti, 1997; Moran, 2005). Structural embeddedness consists of human asset specificity, task complexity, and frequency of exchange under conditions of environmental uncertainty (Granovetter, 1992; Jones, Hesterly & Boragatti, 1997). It also indicates the overall structure of a network and emphasizes how a relationship and its mechanism affect an exchange relationship through constraints (Jones, Hesterly & Boragatti, 1997; Moran, 2005).

When a strong embeddedness relationship (strong ties) exists among organizations, it is likely to increase the number of resource transfers, promote the transfer of implicit knowledge and complicated knowledge, encourage innovation, and enhance innovation performance (Xu et al., 2010). Thus, with regard to structural embeddedness, organizations try to have the same third parties (Jones, Hesterly & Boragatti, 1997). However, relational embeddedness occurs as part of an interactive process related to the quality and depth of a dyadic tie. Members can share more information and knowledge through the network between each partner. Moreover, firms try to consider one another's needs and

goals through trust, confidences, and information sharing (Granovetter, 1992; Jones, Hesterly & Boragatti, 1997; Uzzi, 1997; Kang & Smith, 2016; Kang, Min & Lee, 2016).

From the management perspective, network embeddedness promotes new knowledge creation; however, too much network embeddedness leads to diminished returns. In addition, network disparity has a negative influence on the sharing of existing knowledge such as explicit knowledge and tacit knowledge. Further, technological turbulence seems to weaken this negative impact (Luo & Hassan, 2009; Jang, 2014).

In this current study, we try to argue that relational embeddedness is interactive and has several partners in a network in terms of the quality and depth of a triadic interfirm relationship.

III. HYPOTHESES DEVELOPMENT

The Effect of Environmental Uncertainty and Relational Norms on Interfirm Relationships

Environmental uncertainty is frequently studied as one of the factors of interfirm relationships (Palmatier, Dant, & Grewal, 2007; Paulin & Ferguson, 2010). For example, relational norms encourage channel members to cooperate in their activities more closely. Thus, if firms have positive relational factors of exchange, these can improve adaptability in relationships and moderate the negative impact of environmental uncertainty (Katz & Shapiro, 1985; Artz & Brush, 2000).

However, using other perspectives, studies have argued that a high uncertainty environment provides the flexibility, mutuality, and harmony required for safeguarding parties' interests during an adaptation period (Cannon, Achrol, & Gundlach, 2000; Poppo & Zenger, 2002). Especially in a volatile environment, information changes more rapidly (Noordewier, John & Nevin, 1990; Paulin & Ferguson, 2010). Thus, establishing a low uncertainty environment is unproductive and makes network relationships redundant (Noordewier, John & Nevin, 1990; Cannon, Achrol & Gundlach, 2000; Paulin & Ferguson, 2010; Kim & Cho, 2014).

This current study addresses the second perspective, whereby high environmental uncertainty positively affects relational norms with information that defends a third party's interests during an adaptation period. Consequently, in this regard, we suggest the following hypothesis.

H1: Environmental uncertainty positively influences relational norms.

The Effect of Search Costs and Relational Norms on Interfirm Relationships

Firms should decide how much time and effort to allocate to searching and how much time to spend on each search source (Smith et al. 1999. Factors related to exchange partners enable search costs to be identified and influenced. Parties choose whether to incur these costs in order to continue searching (Smith et al., 1999; Artz & Brush, 2000). Search costs based on transaction costs have supplier dimensions such as human, physical, and temporal costs (Heide & John, 1992). In terms of supplier dimensions, firms have difficulty identifying alternative suppliers and are more committed to their usual suppliers. Thus, search costs can provide benefits by lowering product costs and improving product quality (Artz & Brush, 2000).

Relational norms can create active relationships among parties and reduce opportunistic behavior. With regard to search costs, third parties are willing to help firms concentrate on actions that are designed to enhance network relationships and discourage selfish behavior (Goldberg & Erickson, 1987; Artz & Brush, 2000). Thus, we suggest the following hypothesis.

H2: Search costs negatively affect relational norms.

The Moderating Effects of Network Embeddedness in the B2B Industry

When the extent of a firm's network embeddedness is relatively low, the firm has little connection with a partner's partners (Uzzi, 1996). Moreover, third parties do not restrict the partner's behavioral choices and decision-making. In this situation, even if a firm's partner acts opportunistically, whether by violating a contract or a relational norm, word of the partner's bad reputation may not be easily transferred to the partner's partners, and cannot effectively destroy the relationships between the partner and its partners (Artz & Brush, 2000). Therefore, as the firm's environmental and search cost increase, the firm's partner will be worried about any impact that adverse influences might have on its cooperation with the third parties. Moreover, it may choose to increase its self-interest-seeking behavior, such as violating contractual or relational norms, to maximize its unilateral benefits.

In contrast, when the extent of a firm's network embeddedness is relatively high, the firm has a close relationship with a partner's partners. In this context, third parties play an important role in the focal relationship between the firm and its partner (Kang & Smith, 2016; Kang, Min & Lee, 2016). If a firm's partner acts opportunistically by engaging in search costs under conditions of environmental uncertainty, the firm that is cheated on will inform the whole network and thereby damage the partner's reputation (Jones, Hesterly & Borgatti, 1997; Uzzi, 1997; Houston & Johnson, 2000; Wang, 2015). In this situation, the firm's partner chooses to inhibit self-interested behavior.

Further, when the extent of a firm's network embeddedness is relatively high, firms within the network can develop relational norms through interfirm interactions (Wuyts & Geyskens, 2005). In terms of network embeddedness, efforts to evaluate whether the firms' behavior is appropriate and acceptable, and to reduce attempts to violate relational norms by acting outside the behavior specified by the norms, are typically met with sanctions within the group.

In order to consider these perspectives, this study proposes the following hypotheses.

H3a: A high level of network embeddedness strengthens the effect of environmental uncertainty on relational norms.

H3b: A higher level of network embeddedness mitigates the negative effect of search costs on relational norms in interfirm relationships.

Figure 1. Conceptual Model
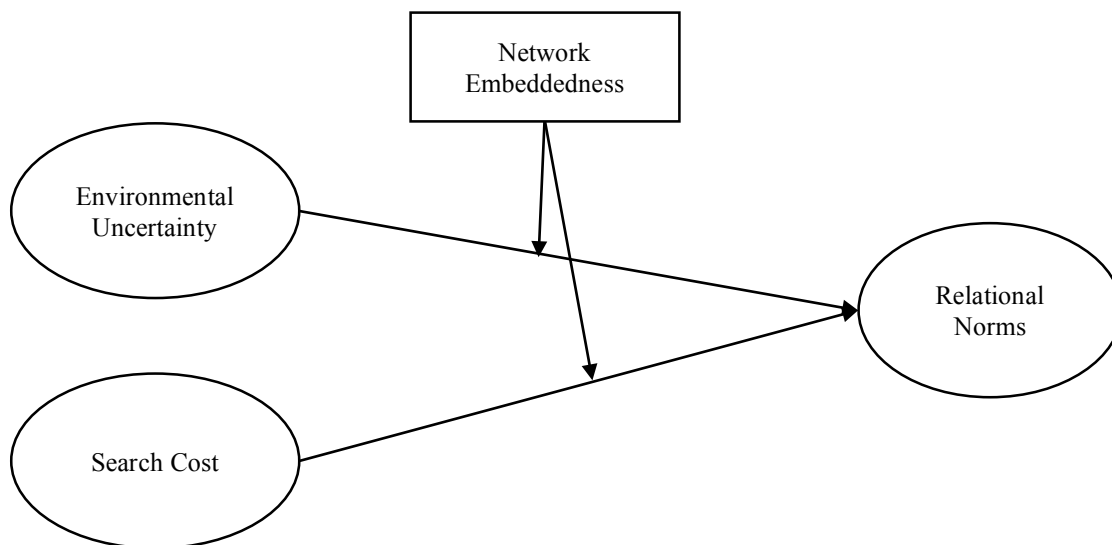
METHODOLOGY

Measurement Development

Environmental uncertainty is measured by Noordewier et al. (1990), and it is illustrated in terms of environmental availability in a highly uncertain market. In this context, the items highlighted are the volatility of products, markets, prices, and real problems.

Search costs are derived from Reimer (2008). They demonstrate the wasted effort, money, and time that retailers and suppliers spend in order to find each other and establish viable relationships. The items focused on are the degrees of wasted time, costs, resources, and efficiency.

Network embeddedness is derived from Uzzi (1996). It refers to the degree of closeness of a manufacturer's relationship with its supplier's partners. The items focused on are intensity, the degree of the relationship's closeness, restrictions to executing transactions, and the collaborative relationship with one or more of the supplier's partners.

Relational norms are measured by Heide and John (1992) and concentrate on the norm of information sharing and the norm of flexibility. The norm of information sharing is adapted from Heide and John (1992) and measures the degree to which information is shared in order to develop a relationship between two parties. The items focused on are the high degree of frequent information exchange, the degree of proprietary information, and keeping informed about changes. The norm of flexibility is adapted for this study from the research of Heide and John (1992) and Lusch and Brown (1996). With regard to this study, buyers were asked to estimate the degree of flexibility when dealing with suppliers. The items focused on are the extent to which the degree of respect for a firm changes and the expectation of coping with changing circumstances.

Measurement

In the current study, the four constructs that are used are environmental uncertainty, search costs, network embeddedness, and relational norms. All items had a seven-point Likert-type scale anchored by 1 = "strongly disagree" and 7 = "strongly agree." Before screening out the variables, we used exploratory factor analysis (EFA).

In order to validate and clarify the measures, we employed a confirmatory factor analysis (CFA) model to assess the constructs' validity (e.g., Grewal et al. 2010). The model fit was as follows: *$\chi 2$ = 370.873; d.f. = 152; p-value = .000; the incremental fix index (IFI) = .925; the goodness-of-fit index (GFI) = .821; the comparative fix index (CFI) = .924; the root mean square residual (RMR) = .089; and the root mean square error of approximation [RMSEA] = .097. The value of RMR is slightly higher than .05 but lower than 1. Overall,* these values suggest that the measurement model is reasonably well fitted.

Table 1 shows each construct item, the average variance extracted (AVE) values, and the factor loadings. All factor loadings are above 0.5 (p < .01), providing convergent validity for each construct.

Table 1. Constructs and Measurement Assessment

Construct Items	AVE	Standardized Loading	C.R.
Environmental Uncertainty			
Item 1		.798	
Item 2	.654	.817	.850
Item 3		.860	
Search Cost			
Item 1		.602	
Item 2	.521	.892	.768
Item 3		.705	
Network Embeddedness			
Item 1		.797	
Item 2	.824	.948	.933
Item 3		.976	
Relational Norms			
Item 1		.837	
Item 2		.807	
Item 3		.927	
Item 4	.577	.939	.841
Item 5		.822	
Item 6		.700	
Item 8		.858	

The AVE values of each construct range from .521 to .824, exceeding the minimum threshold of .50. All values meet the standard representing the convergent validity of each construct.

Table 2. Construct Inter-correlations

	EU	SC	NET	RN
Environmental Uncertainty **(EU)**	1.0			
Search Cost **(SC)**	.242	1.0		
Network Embeddedness **(NET)**	.363	.135	1.0	
Relational Norms **(RN)**	.305	.144	.895[***]	1.0

*p < .1, **p < .05, ***p < .01 and p < .00

Based on the correlations, and following Fornell and Larcker's (1981) procedure, the square roots of the inter-construct correlations and AVE values were compared for discriminant validity. The results range from .018 to .801. Thus, discriminant validity is also satisfied. The results are shown in Table 3.

Table 3. Inter-construct Correlations and Square Roots

Inter-construct	r	r2
EU ↔ SC	.242	.059
EU ↔ NET	.363	.132
EU ↔ RN	.305	.093
SC ↔ NET	.135	.018
SC ↔ RN	.144	.021
NET ↔ RN	.895	.801

Data Analysis and Results

The current study's hypotheses investigate statistically the effects of two variables (i.e., *environmental uncertainty* and *search costs*) on relational norms. The effects change across the range of levels of network embeddedness. In order to test the hypotheses, structural equation modeling (SEM) was used.

A regression equation was estimated as follows:

$$Y = \beta_1 X1 + \beta_2 X2 + \beta_3 X3 + \beta_4 X1X3 + \beta_5 X2X3$$

where

Y	=	relational norm
X1	=	environmental uncertainty
X2	=	search cost
X3	=	network embeddedness
X1X3	=	interaction between environmental uncertainty and network embeddedness
X2X3	=	interaction between search cost and network embeddedness

We calculate that environmental uncertainty has a significant effect on relational norms, whereas there is a marginally significant effect (t = 1.985, p < .047) of search costs on relational norms (t = 1.754, p < .079). Table 4 presents the regression results for the relational norms.

Table 4. Regression Results for the Relational Norms

Constructs	Hypotheses	Estimates	p-values	t-values
Main Effects				
Environmental Uncertainty	H1	.167**	.047	1.985
Search Costs	H2	.141*	.079	1.754
Interactions				
Environmental Uncertainty				
x Network Embeddedness	H3a	-.85*	.064	-1.850
Search Costs				
x Network embeddedness	H3b	-.057	.189	-1.312

*p < .1, **p < .05, ***p < .01, **** p < .001
Note: Standardized parameters and accompanying t-values are reported.

Interaction Effects

We determined whether environmental uncertainty, search costs, and network embeddedness would have marginally significant correlations for a high-embedded group and a low-embedded group. Environmental uncertainty has a significant effect on performance for the group with a low level of network embeddedness (γ= .347, t = 2.709). Further, there is no significant effect for the group with a high level of network embeddedness (γ= .089, t = .747), thus providing support for H3a. The results for γ coefficients indicate that search costs have a significantly positive effect on relational norms for the group with a low level (γ= .364, t = 2.691) and not a high level (γ= .119, t = .907) of network embeddedness. In sum, network embeddedness moderates the relationship between environmental uncertainty and relational norms, and the relationship between search costs and relational norms. Table 5 presents the results for hypotheses 3 and 4.

Table 5. Results for H3 and H4

	Hypotheses	High-embedded group		Low-embedded group	
		Coefficients	t-values	Coefficients	t-values
EU→RN	H3a	.089	.747	.347	2.709***
SC→RN	H3b	.119	.907	.364	2.691***

CONCLUSION

Firms believe that they benefit from potential business opportunities that offer competitive advantage (Barney, 2012; Lo & Shiah, 2016). The current study investigates interfirm relationships in the context of environmental uncertainty through triadic perspectives in a network. Our analysis contains some important contributions. First, our study

demonstrates network embeddedness in interfirm relationships. In the literature, few studies consider search costs in interfirm relationships. Our study's results empirically prove that firms in an embedded network are likely to pursue relational norms in environmentally volatile situations and where there are transaction costs.

Second, our study promotes the understanding of two factors, industrial dynamics and relational norms, regarding the development of interfirm relationships. Exchange partners in situations of volatile uncertainty that involve a great deal of effort are likely to rely on norms because firms are more sensitive to opportunistic behavior in unstable environments. Environmental uncertainty increases the possibility of unstable profits and the opportunistic behavior of exchange partners. According to our analysis, when the degree of embeddedness is low, firms are likely to consider environmental uncertainty and search costs for the purpose of competitive advantage.

This study also has theoretical implications. The first is that most studies based on networks have generally ignored cost perspectives with regard to partners in the web of a firm's network. According to network theory, network embeddedness can bring various benefits to a firm (Emmerik & Sanders, 2004). Thus, parties in interfirm relationships try to engage in network relationships through industrial dynamics.

The second implication is that to create greater profits, suppliers influence factors that reduce the time, costs, and effort wasted when searching for new exchange partners in the context of relational norms. Thus, our findings successfully prove those of the literature related to industrial dynamics in business strategies.

Although this study attempts to enhance insights for future research, a number of limitations are acknowledged. This study focuses on only environmental uncertainty; however, other uncertainty dimensions such as technical uncertainty and volume uncertainty may also have considerable influence on the success of interfirm relationships. Moreover, in interfirm relationships, many firms have first suppliers and second suppliers. Thus, it may be better to conduct assessments using each group of suppliers. Finally, further research should be conducted regarding the influence of both sides in network relationships.

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