The antecedent factors on trust and commitment in supply chain relationships

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Abstract

The primary purpose of this study is to investigate the role of information sharing, information quality, and information availability in the development of trust and commitment in supply chain relationships. Samples were gathered in Taiwan and Canada using a field questionnaire. Multiple regression and ANOVA were used to analyze the data. It was found that there is a positive relationship between the level of quality, and availability, and the level of trust; information sharing and commitment. Additionally, results revealed that country moderates the relationship between information sharing and trust.

Keywords: Supply chain, Information sharing, Information quality, Information availability, Behavioral uncertainty, Trust, Commitment

1. Introduction

In today's global business environment, successful supply chain integration with information management has attracted much attention from both practitioners and researchers. Supply chain integration attempts to minimize operational costs and enhance stakeholder value, by sharing information between partners. Shared information, commitment and trust between and among partners has become an essential element for supply chain integration [3,68], and commitment to ongoing relationships among supply chain members helps increase efficiency and effectiveness [28,61,63]. Commitment is highly related to trust [34]. Both trust and commitment stimulate a relational bond between suppliers and customers that facilitates the establishment of productive collaborations [20]. Both commitment and trust are essential to promote efficiency, productivity and effectiveness in outcomes [53]. Successful supply chain performance is based on a high level of trust and a strong commitment among supply chain partners [35].

The objective of this paper is to provide a clearer understanding of how information availability, as well as inter-organizational information sharing, and the quality of the information shared/available affect the level of trust and commitment in supply chain relationships. While a number of other antecedents for trust and commitment in supply chain relationships undoubtedly exist, the aim of this research is to investigate the role of information availability, sharing, and quality in the development of trust and commitment. In addition, this study aims to determine whether or not behavioral uncertainty plays a moderating role between the levels of information availability,
information sharing, and information quality within the supply chain and the level of trust between supply chain partners.

2. Theoretical framework

2.1. Trust

Trust has been identified as one of the key factors contributing to a strategic alliance success [33,62]. Trust is defined as a willingness to rely on an exchange partner [52], and characterized by the belief that the partner will not indulge in opportunistic behavior [55]. Morgan and Hunt [53] suggest that the confidence on the part of the trusting party results from the belief that the trustworthy party is both reliable and has high integrity. Both reliability and integrity are associated with a number of sub-dimensional constructs including honesty, benevolence, and competence [12,29,44]. Trust results in a belief that a partner company will perform actions that will result in positive outcomes for the firm, as well as that the partner company will not take unexpected risks that result in negative outcomes [2].

Trust reduces the perception of risk associated with opportunistic behavior [33,51], diminishes the fear of information disclosure [39], encourages information flow and strengthens the belief in the content of the information that is received. Studies also show that trust is related to relationship success [57], stability [23], and performance [73] in supply chain partnerships.

A leading cause for unsuccessful relationships is the lack of trust between the partners [66]. A lack of trust among trading partners creates a condition where every transaction has to be scrutinized and verified, increasing the transaction costs. These transaction costs often arise out of an emphasis on complex contracts, detailed confidentiality agreements, and specific continuous improvement clauses [14]. Therefore, in the absence of trust, companies essentially try to mediate cooperation. Trust enables members of the supply chain team to rely on one another [45].

2.2. Commitment

For an enduring relationship to develop, commitment and joint-action of the involved parties is required to support the recurring exchanges [24]. Commitment refers to an exchange partner’s belief that an ongoing relationship with another is so important as to warrant maximum efforts at maintaining it; that is, the committed party believes the relationship endures indefinitely [53]. A commitment between trading partners refers to the willingness of buyers and suppliers to exert effort on behalf of the relationship [50,64]. Commitment is an important variable for long-term success because supply chain partners are willing to invest resources, sacrifice short-term benefits for long-term success [46,47]. Organizations build and maintain long-term relationships if they perceive mutually beneficial outcomes accruing from such a commitment [53]. Wilson and Vlosky [70] identify commitment as the variable that discriminates between relationships that continue and those that break down. Kwon and Suh [36] suggest that “any enduring business transactions among supply chain partners require commitment by two parties in order to achieve their common supply chain goals.” Commitment that a trading partner has to the relationship is the key to achieving desired outcomes for both firms, and has a direct and positive impact on performance [60].

Fig. 1 presents a visual summary of the concepts used in this study.

2.3. Conceptual model

The key objective of this study is to explore the factors that affect the level of trust and commitment in supply chain relationships. Conceptually, the study tests the linkage between the information available, information shared and the quality of information in the supply chain with the level of trust and commitment. Additionally, this study postulates that the lower the level of behavior uncertainly, the higher the level of trust among supply chain partners. In addition, country is introduced as a possible moderating variable, moderating the effects of information sharing, information quality, and information availability on trust.

3. Testable hypothesis

3.1. Information sharing

Information sharing is an important component of cooperation in supply chain management [5], and at the core of collaborative, supply chain based business models [15]. Information sharing plays a key role in matching supply with demand to reduce the cost of excess inventory and loss of profits from stock outs [41]. Supply and demand mismatch in the supply chain is often caused by uncertainty from lack of information sharing in forecasting [36]. Information asymmetries can be reduced by sharing inventory, production, and sales data, along with planning and forecasting information [59]. Transaction risks can also be reduced by sharing, monitoring, and controlling, information, such as performance metrics, and production and delivery schedules [31].

Using a multi-organizational case study, Ghosh and Fedorowicz [19] conclude that an information sharing relationship between retailers and suppliers helps to build up trust over time. Effective inter-firm communications is a key part of information sharing that increases understanding of both parties and contributes positively to better partnership quality [37]. Information sharing is essential to the trust-building process as the sharing of information enables each firm to understand each other’s routines better, and develop conflict resolution mechanisms [35,57]. When members hesitate to provide and share information with other parties in the supply chain, it can hinder the trust-building process [8]. Greater sharing of information reduces uncertainty and increases the level of trust in the relationship [36,50,57]. Based on the above arguments, we hypothesize that:

H1. There is a positive relationship between the perceived level of information sharing and the level of trust.

3.2. Information availability

Information availability in the current study is defined as the perceived availability of information in the supply chain as a whole. In other words, it refers to the extent to which relevant information is available to all participants within a supply chain equally, beyond the information which is actively shared between partners within the supply chain. Uzzi and Lancaster [67] differentiate between public and private information in the supply chain. Public information such as audited financial statements, prices, contractual stipulations, and
warrantees are available in the public domain and is verifiable through third parties. Private information, such as operational, strategic information, however, is not available in the public domain and/or verifiable through third parties [32]. In contrast to information sharing which is the extent to which critical and proprietary information is communicated to one’s supply chain partner [50], information availability refers to the extent to which information is readily available within the supply chain and does not need to be solicited or actively shared by a partner.

A lack of information availability, as well as information asymmetries, lead to greater operational inefficiencies, transaction risks, and coordination costs [9]. Delays in information availability, often attributed to the distributed location of information across the supply chain and its inaccessibility, lead to reduced information visibility, poor forms of interaction, and mismatches between supply and demand [7,38]. It is reasonable to assume that operational inefficiencies, greater transaction risks, higher coordination costs, reduced information visibility, poor forms of interaction, and mismatches between supply and demand would reduce the level of trust between supply chain partners. Hence, we can hypothesize:

**H2.** There is a positive relationship between the perceived level of information availability and the level of trust.

Since information that is available, does not have to be actively solicited or explicitly shared, the amount of information shared might depend on the information already available. When information already exists in the supply chain, the lesser is the need to explicitly share. Hence, we expect that

**H3.** There is a negative relationship between the perceived level of information availability and the perceived level of information sharing.

### 3.3. Information quality

While information sharing is important, the significance of its impact on supply chain management is dependent upon what information is shared, when and how it is shared, and with whom [6]. Shared information must exhibit certain attributes to create value for the partner firm [19]. Information quality includes aspects such as the accuracy, timeliness, adequacy, reliability, credibility, understandability and ease of use of the information exchanged [10,50]. Inter-organizational cooperation increases the need to share confidential information [22]. Only when firms share vital and often proprietary decision making information, can trust be established [15]. If all parties in the network do not have real-time information about product specifications, transaction costs can be expected to increase due to the complexity and uncertainty of the information [22]. Kwon and Suh [35] found that the presence of such uncertainty impedes the development of trust in supply chain relationships. Information of low quality cannot be expected to raise the level of trust in the supply chain. For this to occur, information must be accurate and timely in nature [27]. Therefore:

**H4.** There is a positive relationship between the perceived level of information quality and the level of trust.

Mason-Jones and Towill [42,43] suggest that organizations may deliberately distort the information that potentially reaches not only their competitors but also those of their own suppliers or customers. Since, information disclosure is perceived as a loss of power, there is a built in reluctance to share more than minimal information [40]. Moberg et al., [49] state that information that is not reliable or invalid, has little value. Jarrell [27] notes that sharing information within the entire supply chain can create flexibility, but this requires quality information that is both accurate and timely. Distortion of information reduces the information quality and the usefulness, benefits of information sharing. The net result might be that neither party will use the distorted shared information to make decisions [48]. Hence, we hypothesize that

**H5.** There is a positive relationship between the perceived level of information quality and the perceived level of information sharing.

### 3.4. Trust and commitment

A number of studies have found a positive relationship between trust and commitment [35,36,53,71]. Trust is a major determinant of relationship commitment [53]. No commitment is consummated unless the partners feel that trust has been established [36]. Chu and Fang [8] indicate that the level of commitment is strongly related to the level of trust. Therefore, we arrive at the following:

**H6.** There is a positive relationship between the level of trust and the level of commitment.

**H7.** The path relating information sharing, information quality and information availability to commitment is mediated by trust.

### 3.5. Trust as a mediating variable

Studies have found that trust serves as a significant mediating variable between a number of variables and commitment [8,36]. A mediator variable is a variable that describes “how rather than when” effects will occur by accounting for the relationship between the independent and dependent variables. A mediating relationship is one in which the path relating A to C is mediated by a third variable (B). This study proposes that information sharing, information quality, and information availability influences commitment by way of mediating variable trust.

### 3.6. Behavioral uncertainty and trust and the moderating role of behavioral uncertainty

A source of great tension in strategic alliances is concern about the partner's behavior [58]. Much of the concern arises from behavioral uncertainty—that is, the potential inherent in a situation for difficulty anticipating and understanding actions of partners [33]. Behavioral uncertainty arises from the difficulties associated with monitoring the performance of transaction partners [69]. The effect of behavioral uncertainty is a performance evaluation problem—that is, difficulty in ascertaining ex post whether contractual compliance has taken place [18].

When there is a high interdependence among partners, such as when the partners are developing new technology together, behavioral uncertainty by a partner such as a change introduced by one partner, likely affects the other partners in unplanned ways and mistakes made by one partner likely impacts other partners more severely [33]. Kwon and Suh [36] found behavioral uncertainty and trust have an inverse relationship. High behavioral uncertainty was found to be associated with lower levels of trust, and low behavioral uncertainty was found to be associated with higher levels of trust. Predictability of a partner's behavior can contribute to reducing the uncertainty, which lowers the transaction costs in the relationship. Trust is present when a firm believes its partner to be honest and benevolent [12]. In contrast, behavioral uncertainty is the inability to predict partners' behavior [29]. It is reasonable to believe that high levels of behavioral uncertainty may exert a negative influence on the level of trust, as well as diminishing the positive effects of information sharing, information quality, and information availability because the presence of behavioral uncertainty makes it difficult to predict that a
partner will behave in an honest and benevolent manner. Therefore, we arrive at the following hypotheses:

**H8.** There is a negative relationship between the level of behavioral uncertainty and the level of trust.

**H9.** Behavioral uncertainty will negatively impact the positive influence of information sharing, information quality and information availability on trust.

### 3.7. The moderating role of country

Hofstede [25] defines culture as the collective programming of the mind which distinguishes the members of one group or country from the members of another. Huff and Kelley [26] and Doney et al. [11] have found that national culture influences an individual’s propensity to trust. It is therefore reasonable to hypothesize that Taiwan and Canada respondents will differ in their propensities to trust. Thus, country is introduced as a possible moderating variable, moderating the effects of information sharing, information quality, and information availability on trust. Therefore, the following hypothesis is proposed:

**H10.** Country will moderate the effects of information sharing, information quality, and information availability on trust.

### 4. Research method

A questionnaire was implemented to empirically test the model. The items used to operationalize the constructs in Fig. 1 were primarily derived from past studies. Established measures for information availability were not found, and hence the measurement items for information availability were developed based on interviews with supply chain professionals. The constructs and their sources are summarized in Table 1. All questions used a 1 to 7 scale where 1 meant “strongly disagree” and 7 “strongly agree”. The questions and items are provided in Appendix A.

This study sought to choose respondents for the questionnaire who could be expected to have the best knowledge about the operation and management of the supply chain in his/her organization. There were two target samples for this study. The first was managers within, but not limited to, Alberta, Canada’s oil and gas industry. The large size of the energy sector in Alberta, Canada, as well as the ongoing global demand for energy, makes such a sample desirable. The questionnaire was distributed to managers within Taiwan’s largest semiconductor companies, including Taiwan Semiconductor Manufacturing Company Ltd. (TSMC) and United Microelectronics Corporation (UMC), as well as to managers from smaller to medium sized companies in a number of industries. Again, the scale of Taiwan’s semiconductor industry, as well as the importance it holds in Taiwan’s economy, makes this sample desirable.

#### 4.1. Data analysis

This section addresses the results of the data analysis that were conducted for this study. First, the results of factor analysis and reliability tests are presented and discussed. The factor analysis is followed by analysis of variance (ANOVA), and regression analyses to test the research model.

#### 4.2. Factor analysis and reliability tests

Exploratory factor analysis was conducted to identify the dimensionality of each research construct, to select questionnaire items with higher factor loadings, and to compare the selected items with items suggested by theory. Item-to-total correlation and Cronbach’s alpha were assessed to identify the internal consistency and reliability of the construct. Finally, latent roots (Eigen values), scree test, and other criteria were employed to determine the number of dimensions to be extracted from the principal component factor analysis. For this study the following criteria were used: (1) factor loadings >0.5, Eigen value >1, cumulatively explained variance >0.6, item-to-total correlation >0.5, and Cronbach’s alpha >0.6 [17,56,65].

Table 2 shows the results of the factor analysis and reliability tests. Five items (IS2, IS4, Trust9, Com7, and Com6 (see Appendix for items)) were deleted because of factor loadings below 0.5. An additional nine items (IS1, IS3, IS7, Com8, Com 9, BU1, BU2, BU3, and BU4) were deleted because of item-to-total correlations below 0.5. The remaining items satisfied the criterion set above for this study and the results show a fairly high degree of internal consistency for each dimension. The Cronbach alphas for all constructs were above 0.88 confirming the reliability of the measurement items.

#### 4.3. Analysis of variance (ANOVA): country and stage of supply chain

Analysis of variance (ANOVA) is a statistical technique used to determine, on the basis of one dependent measure, whether or not samples are from samples with equal means [21]. In the case of this study, ANOVA was used for the purpose of determining whether significant differences exist according to country (Taiwan vs. Canada), and the stage of supply chain (supplier, manufacturer, distributor, retailer, or multiple roles). F-values greater than 4 and P-values less than 0.05 indicate significant differences.

Table 3 presents the results of ANOVA for country (Canada vs. Taiwan) and each of the research constructs.

The results show that respondents from Canada and Taiwan have significantly different levels of information sharing, information quality, information availability, and commitment. The Taiwan respondents show a higher perceived level of information sharing, information quality, information availability, and commitment compared to Canadian respondents. The levels of trust and behavioral uncertainty revealed no significant differences between the two countries.

Analysis of variance results (Table 4) show that no significant differences exist among suppliers, manufacturers, distributors, retailers or those playing multiple roles within the supply chain for each of the research variables. None of the F-values exceed 4.00. Nor do any of the P-values fall under 0.05. Thus, these results indicate that the stage of the supply chain has no confounding effects upon the results of this study.

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**Table 1**

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4.4. Regression analysis

Linear regression analyses were conducted for this study. Table 5, summarizes the results of the regression analysis. In the first regression analysis information sharing was the dependent variable, and independent variables were information availability and information quality. Information quality (H5, β<.00) affects the perception of the information shared in the supply chain. In contrast, information availability does not influence information sharing. It appears that information availability and information shared are indeed complementary concepts, and one is measuring the freely available information and the other explicitly shared information.

A second regression analysis was run with trust as the dependent variable and information sharing, information quality, information availability, and behavioral uncertainty as the independent variables. The results reveal that information availability (H2, β<.016) and information quality (H4, β<.022) are good predictors of trust developed between supply chain partners. However, both information sharing and behavioral uncertainty do not seem to be significant predictors of trust. The adjusted R² was 0.16 and is low, signifying that other factors not considered in the study play a role in the variation of trust.

Trust (H6, β<.001) was also found to be a significant predictor of commitment. To check whether trust plays a mediating role in the determination of commitment, another regression was run with trust, information sharing, information availability, information quality and behavioral uncertainty as the independent variables and commitment as the dependent variable. The results show that information sharing and trust are both significant determinants of commitment (R² = 0.35), whereas the other variables remained non-significant. This result suggests that trust does indeed play a mediating role between information quality, information availability and commitment. Information sharing appears to not significantly affect trust (H1), but affects commitment directly. Commitment indicates a
willingness to invest resources in the supply chain [39], and sharing proprietary and private information is perhaps an indication of that effort.

4.5. Interaction effects of information and behavioral uncertainty/country

In order to test the moderating effects of behavioral uncertainty on trust, this study used the general linear model to test the proposed research model. In order to constitute which values were to be considered high levels of behavioral uncertainty, and which values were to be considered low levels of behavioral uncertainty, the mean score for the variable was used as the cut-off point. Similarly, high and low levels of information sharing, information quality, information availability were calculated, resulting in four factors with two levels each. The dependent variable is trust. The results in Table 6 indicate that interaction effects of behavioral uncertainty are not significant. Hence, behavioral uncertainty does not moderate the effects of the information variables on trust.

Table 7 indicates that the country variable has moderated the effects of information sharing on trust (P<.01). However, country does not moderate either information availability or information quality. It appears that for the Canada sample there exists a stronger positive relationship between information sharing and trust, than for the Taiwan sample. Interestingly, for the Taiwan sample, levels of trust actually slightly decreased as levels of information sharing increased. These results can possibly be explained best by a study conducted by Huff and Kelley [26]. In their seven-nation study examining the levels of organizational trust in individualist and collectivist societies, they found that those from collectivist societies had a lower propensity to trust those from another organization, than those from an individualist society. Since Taiwan is considered significantly more “collectivist” than Canada on Hofstede's individualism/collectivism dimension [25], the results of this study appears reasonable.

Table 8, summarizes the results of the analysis. Four of the ten hypotheses were fully supported and partial support was obtained for H7 and H10. In H7, support was obtained for trust to mediate the relationship between information availability, information quality and commitment. In H10, country was found to moderate the effect of information sharing on trust.

5. Conclusions

5.1. Research limitations and directions for future research

The validity and reliability may have been negatively affected by a few limitations present in conducting this research. The small sample size (n=121) used for this study is one such limitation. This is particularly the case concerning the small Canada sample size (n=30), compared to the much larger Taiwan sample size (n=91). The discrepancy between the two sample sizes brings into question the validity of the findings concerning the differences between the Taiwan and Canada samples. Future research would be desirable in order to verify the results relating to these differences, as well as to more fully explore national culture as a moderating variable between a number of independent variables and trust.

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R-Sq = 19.98%, R-Sq(adj) = 15.02%.
commitment stimulate a relational bond between suppliers and strong commitment among supply chain partners [35]. Both trust and improve their paramount importance for managers to consider ways in which to fi between supply chains rather than between firms’ inter-organizational supply chain relationships. Supply chain performance is based on a high level of trust and a strong commitment among supply chain partners [35]. Both trust and commitment stimulate a relational bond between suppliers and customers which facilitates the establishment of productive collaborations [20]. Therefore, managers look for ways in which they can increase the levels of trust and commitment in their supply chain partners. Building the trust and open culture needed is a slow and difficult process [16]. While a number of other antecedents for trust and commitment in supply chain relationships undoubtedly exist, the aim of this research is to investigate the role of information (sharing, quality, and availability) in the development of trust and commitment. This study found that information quality, and information availability play a positive role in building trust, and subsequent commitment, while information sharing affects commitment in supply chain partners. Therefore, active sharing of high quality of information and making it readily available to supply chain partners is desirable. Obviously a great deal of information is considered sensitive, and a firm must use discretion when releasing such information. However, the findings of this study indicate that managers should make an effort to reassess, and weigh the risks and benefits, of making certain information available to other firms within the supply chain.

5.2. Implications for managers

Since there is a growing recognition that modern competition is between supply chains rather than between firms [4,30], it is of paramount importance for managers to consider ways in which to improve their firms’ inter-organizational supply chain relationships. Our respondents came from within the same supply chain and had different roles (manufacturer, distributor, supplier etc.) along the supply chain. We however, did not link the different respondents to each other. Linking the suppliers as Tier 1, Tier 2 would lead to a more robust study.

Table 7
ANOVA for trust — (country moderating).

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</table>

R-Sq = 27.60%. R-Sq(adj) = 23.11%.

A second limitation of this study was the relative homogeneity of the respective samples. Since the majority of the Canada sample was from the oil and gas industry, and the majority of the Taiwan sample was from the technology industry, the external validity of this study is limited. Future research, to test whether the results of this study can be generalized across a number of industries, or indeed a number of different cultures, is desirable.

Appendix A (questionnaire items)

Information sharing

1. We inform our trading partners in advance of changing needs.
2. Our trading partners share proprietary information with us.
3. Our trading partners share business knowledge of core business processes with us.
4. Our trading partners inform us in advance of changing needs.
5. We share proprietary information with our trading partners.
6. We share business knowledge of core business processes with our trading partners.
7. Our trading partners keep us fully informed about issues that affect our business.
8. We and our trading partners exchange information that helps establishment of business planning.
9. We and our trading partners keep each other informed about events or changes that may affect the other partners.
10. We share common information technology (software) to facilitate communication with our partners.
11. Information sharing on important issues has become a critical element to maintain our partnerships.

Information quality

1. Information exchange between our trading partners and us is timely.
2. Information exchange between our trading partners and us is accurate.
3. Information exchange between our trading partners and us is complete.
4. Information exchange between our trading partners and us is adequate.
5. Information exchange between our trading partners and us is reliable.

Information availability

1. Information regarding changes in Supply is readily available within our supply chain.
2. Information regarding changes in Demand is readily available within our supply chain.
3. Information regarding changes in product Price is readily available within our supply chain.
4. Information regarding company Costs is readily available within our supply chain.
5. Information required to manage our company's performance is readily available within our supply chain.

Behavioral uncertainty
1. We can accurately predict the performance of our partners for our next business cycle.
2. We know that our partners will adapt quickly, should we change our specifications at short notice.
3. We can predict changes in the pricing of our partners' products/services for the next year.
4. We can predict the introduction of our partners' new products/services.
5. Availability of our partners' products/services is highly uncertain. (REVERSE SCALED)
6. Uncertainties in dealing with our partners are a real problem. (REVERSE SCALED)
7. Dealing with our partners is complex. (REVERSE SCALED)
8. Supply of our partners' products/services is not stable. (REVERSE SCALED)
9. Prices for our partners' products/services are volatile. (REVERSE SCALED)

Trust
1. Even when our partners give us a rather unlikely explanation, we are confident that they are telling the truth.
2. Our partners have often provided us with information that has later proven to be accurate.
3. Our partners usually keep the promises that they make to our firm.
4. Whenever our partners give us advice on our business operations, we know that they are sharing their best judgment.
5. Our organization can count on our partners to be sincere.
6. Though circumstances change, we believe that our partners will be ready and willing to offer us assistance and support.
7. When making important decisions, our partners are concerned about our welfare.
8. When we share our problems with our partners, we know that they will respond with understanding.
9. In the future, we will count on our partners to consider how their decisions and actions will affect us.
10. When it comes to things that are important to us, we can depend on our partners' support.

Commitment
1. Even if we could, we would not drop our partners because we like being associated with them.
2. We want to remain a member of our partners' network because we genuinely enjoy our relationship with them.
3. Our positive feelings towards our partners are a major reason we continue working with them.
4. We expect our relationships with our partners to continue for a long time.
5. The renewal of our relationships with our partners is virtually automatic.
6. It is unlikely that our firm will still be doing business with our current partners in two years. (REVERSE SCALED)
7. If our partner requested it, we would be willing to make further investment in the relationship.
8. We are willing to put more effort and investment in building our business in relation to our partners.
9. In the future we will work to link our firm with our partners in the customer's mind.

References