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Customer-Supplier Joint Action & Shared Results

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구매-공급자간의 공동활동과 그에 따른 결과의 공유

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The purpose of this research is to study customer-supplier relationships, particularly their partnerships, to help managers and practitioners successfully design, develop, implement and deploy tools and joint practices as a means for an effective supply chain management (SCM). To achieve this purpose, a total of 1,811 potential survey questionnaire respondents responsible for purchasing, sales/marketing, quality-, and production- or operations-related functions of U.S. private manufacturing companies in SIC 35, 36, and 37 were used to collect quantitative data. Using 172 usable survey questionnaire responses, eight hypothesized relationships were tested using two independent (joint use of specific tools and joint practices) and four dependent variables (informed partners, role integrity, conflict resolution, and mutuality). From the overall perspective (customer + supplier), organizations with higher levels of joint action have higher degrees of informed partners whereas organizations with higher levels of joint action resolve conflicts formally and do not have higher degrees of mutuality.

1. Introduction-Problem Statement

Increasing international competition in many industries has required manufacturers to undertake strategic realignments of various kinds between customer and supplier organizations (Lyons, Krachenberg, & Henke, 1990). One of the most noticeable changes has been in the relationship between customer and supplier organizations, where managers of each organization have frequently made deliberate efforts to establish strong relationships with managers of another party (Heide & Stump, 1995). The nature of customer-supplier relationships has undergone significant changes during the last few years (Heide & John, 1990). Many industry observers and quality experts describe these relationships as becoming closer (Business Week, 1987). Terms such as partnerships (Ellram, 1991; Hendrick & Ellram, 1993; Johnson & Lawrence, 1988; Stuart & Mueller, 1994), alliances (Bleeke & Ernst, 1995; Day, 1995; Lamming, 1993; Spekman, 1988; Varadarajan & Cunningham, 1995) and SCM (Supply Chain Management) are being used to differentiate these relationships from the more traditional arm's length, transaction-oriented relationships.

Much literature and research on organizational transformation processes has dealt with theories and practices that include brief introductions to upstream management. Leading edge customer-supplier partnerships are found only in many quality experts' theoretical assertions and a few internationally well-known companies. Except for a few organizations, such as Ford, GM, and Xerox, that are well-known and recognized for upstream system management and have won nationally renowned awards, e.g., the Malcolm Baldrige National Quality Award, there is little research on the systematic and specific approaches used by many organizations to improve customer-supplier partnerships. There is apparently no empirical research on the content of customer-supplier partnerships. The anecdotal case studies are of little help as there are little or no arguments about the definitions of terms such as closeness and partnership. This is because they do not provide evidence that can be generalizable to other customer-supplier partnerships. Supply chain management, especially customer-supplier partnerships, cannot be operationally

defined only by exemplary cases. The definition should include detailed and planned analysis and evaluation of what customer and supplier organizations are doing to increase their level of partnerships. Without operationally defining customer-supplier partnerships, it is difficult for managers of customer and supplier organizations to succeed in internal / external and domestic/international competition.

2. Operational Research Model

The operational research model in <Figure 1> shows a research question, independent/dependent variables, and their hypothesized relationships, which are explained in-depth in the following sections.

The Customer-supplier partnership is characterized by their joint action, which is in turn defined as *the inter-penetration of organizational boundaries* (Guetzkow, 1966) to accomplish the goals and objectives of both organizations. In traditional customer-supplier relationships, the responsibility for a given task is assigned to either the customer or supplier organization. On the other hand, a move toward a partnership involves two parties carrying out the focal activities in a cooperative or coordinated way.

2.1 Independent and dependent variables

As shown in <Figure 1>, customer-supplier joint action is treated as the independent variable in this non-experimental research study, while the four shared result measures are treated as dependent variables.

Independent variables

The customer-supplier joint action has been one of the foci of relationalism research. Some researchers (Heide & John, 1990; Lamming, 1993) have considered customer-supplier joint action as the desired outcome of customer-supplier partnerships that greatly influence the performance of both organizations. In this research, customer-supplier joint action is assessed via two indicators: (1) joint use of specific tools and (2) joint practices. The customer-supplier joint action characterized by using specific tools is defined as the use of pre-determined or suggested steps or procedures to implement a given tool in this research. Examples can be joint use of tools such as Quality Function Deployment (QFD) to design and develop new parts or products to meet the needs/wants of the final customer or Just- In-Time (JIT) delivery systems to streamline the flow of parts and components. On the other hand, the customer- supplier joint action categorized by joint practices refers to activities characterized by personal contacts rather than by using specific tools. Examples are meetings between customer and supplier personnel for joint planning and problem- solving or an exchange of strategic information.

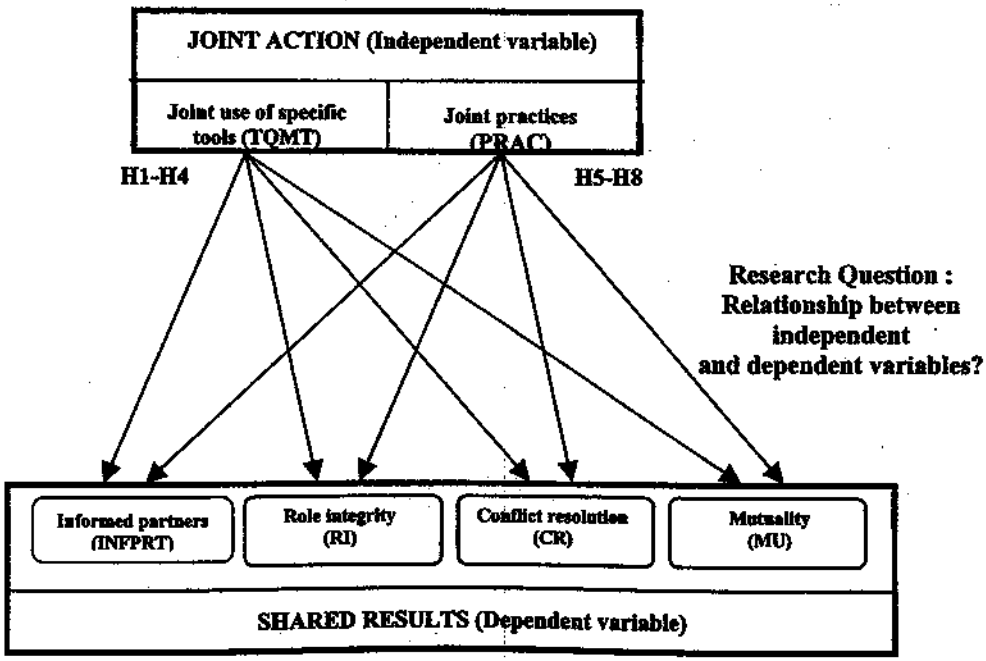

Figure 1. Operational Research Model.

Dependent variables

Most joint activities used in customer-supplier partnerships require and encourage both organizations to share the results of their joint action. However, the results of joint action may be anything from deteriorated customer-supplier relationships to an ideal situation where future joint practices can be implemented and deployed in a more aligned environment.

The four shared results dimensions introduced later -informed partners, role integrity, conflict resolution, and mutuality - are used in this study to examine the broader scope of the results of customer-supplier joint action. As explained in greater depth in the following section (Hypotheses), these four shared results dimensions indirectly encompass specific performance measures, as well as behavioral measures. For example, the two shared results dimensions - role integrity and mutuality - closely relate to specific and monetary performance measures such as investments and sharing of benefits and expenses, whereas the other two shared results dimensions - informed partners and conflict resolution - focus on behavioral measures such as a willingness to resolve problems informally and a capability of being flexible in changing business/operating environments.

2.2 Hypotheses

Informed partners (INFPRT)

If change is to occur in the operations between two parties so that they conform to changes in the environment, it must either be envisioned and permitted within the existing relationship, or it must be possible for the existing operational specifications to be modified in an appropriately negotiated way. Informed partners involve smooth alterations in practices and policies by understanding each other's operations in the light of unforeseen or changing conditions (Boyle *et al.*, 1992). In customer-supplier partnerships, two organizations have open-ended attitudes in terms of requiring and accepting changes in their operations. This is because the informed partners define a bilateral expectation of willingness to make adaptations as operating environments change. The argument in this section can be summarized as the 1st and 5th hypothesis:

H1: Organizations with higher levels of joint use of specific tools have higher degrees of informed partners.
H5: Organizations with higher levels of joint practices have higher degrees of informed partners.

Role integrity (RI)

Roles in the customer-supplier relationship have intricate interlinkings of habits, custom, internal principles and rules, social relationships, and expectations about the future. In other words, role integrity is the extent to which parties maintain highly complex and multi-dimensional roles. In the context of customer-supplier partnerships, both parties enact roles that not only govern the individual joint activity, but also cover a multitude of issues not directly related to any single activity. The transition from the traditional arm's-length relationship to the partnership is characterized by a change from simple and unidimensional to highly complex roles (Kaufmann & Stern, 1988 and 1992).

The above argument can be summarized as the 2nd and 6th hypothesis:

H2: Organizations with higher levels of joint use of specific tools have higher degrees of role integrity.
H6: Organizations with higher levels of joint practices have higher degrees of role integrity.

Conflict resolution (CR)

In the traditional arm's-length and isolated operating environment, conflict resolution is a formal and external process. The formal and external process can be viewed as institutionalized in that it represents policies implemented by the customer and supplier organizations to address conflict in a systematic and ongoing manner (Dant & Schul, 1992). However, in customer-supplier partnerships, conflict resolution tends to be informal and internal (Kaufmann & Dant, 1992). MacNeil (1980) indicates that the more relational an exchange becomes (in other words, the higher the level of joint action between customer and supplier), the more a separate and distinct (and also internal and informal) social order is created within the relationship itself. The informal and internal process is a mechanism consisting of activities or processes, rather than systematic policies that make conflict resolution more smooth and favorable to each party. The argument in this section can be summarized as the 3rd and 7th hypothesis:

H3: Organizations with higher levels of joint use of specific tools resolve conflicts less formally.
H7: Organizations with higher levels of joint practices resolve conflicts less formally.

Mutuality (MU)

Mutuality implies the requirement of a positive incentive to cooperate with the partner. Under the traditional arm's-length and isolated operating environment, each party requires positive outcomes from each discrete transaction and envisions monitoring each transaction as if it were the last and only mechanism capable of delivering the desired outcomes. However, in a customer-supplier partnership, two parties expect generalized reciprocity emanating from their ongoing and indeterminate relationships (Kaufmann & Dant, 1992). Mutuality also refers to equity in the distribution of surpluses (or benefits) and burdens over the course of the business transaction. Because benefits and deficits accrue somewhat unpredictably in the course of business relationships, the two parties need general principles for sharing them. Under a high level of mutuality, benefits are evaluated over a long period of time rather than on a transaction-by-transaction basis (Boyle *et al.*, 1992). Thus the argument can be summarized as the 4th and 8th hypothesis:

H4 : Organizations with higher levels of joint use of specific tools have higher degrees of mutuality.
H8 : Organizations with higher levels of joint practices have higher degrees of mutuality.

3. Development of Data Collection Instrument Survey Questionnaire

To test the proposed hypotheses, it is necessary to collect the appropriate amount of quantitative data from which conclusions could be reached concerning the relationships between independent and dependent variables. To develop the survey questionnaire, the steps below were followed.

After specifying the domain of constructs (or variables) used in this research in Section 2, the next step is to generate items which measure or capture the domain as specified. For the survey questionnaire items used in this research, three sub-steps below were followed before the final survey questionnaire was developed.

3.1 Initial survey questionnaire development

The initial survey questionnaire was developed by the researcher based on readings and observation of literature on customer-supplier partnerships in disciplines such as marketing, purchasing, and industrial engineering. However, most items developed in this step were not directly adopted from the previous literature on customer-supplier partnerships. This is because the focus and objectives of previous customer-supplier partnership research are different from this research. Therefore significant changes were made to those items adopted from the previous literature.

3.2 Pilot study

The pilot study was conducted using 46 managers of previous SPQA (Senate Productivity and Quality Award of the state of Virginia, USA) applicant companies for their feedback on the appropriateness of each item of the survey questionnaire. A 21.7% response rate (10/46) was obtained and appropriate changes were made to the initial survey items.

3.3 Focus group interview

The intent of the focus group interview was to promote self-disclosure among participants by providing them with an environment to discuss and share ideas. There were two purposes for the focus group interview as used in this research. The first was to gain a better appreciation for the practitioner's perspectives on customer-supplier partnerships, especially customer-supplier joint action and shared results, and second, to improve the overall quality of the survey questionnaire initially developed by the researcher. Three ASQ(American Society for Quality) Radford-Roanoke Chapter members participated in the focus group interview(February 12th, 1997; Virginia Tech Continuing Education Center).

After going through all three steps above and making necessary changes, the final version survey was completed. The final version survey is shown in Appendix A.

4. Data Collection and Analysis Procedures

4.1 Sampling strategy for the survey questionnaire

Because one of the major objectives of this study was to draw generalizable conclusions to the extent possible, ideal data would be drawn from the total population. To obtain this objective with limited

resources in terms of access, time, and funding, the following five sample selection criteria were used: (1) Industry type and ownership: private manufacturing, (2) Geographic location: U.S.-based, (3) Number of participants: 1,811 potential respondents, (4) Industry scope: SIC 35, 36, and 37, and (5) Nature of participants: partnerships.

The first criterion indicates that this study sampled only privately-owned manufacturing companies. The second criterion specifies limiting the research scope to U.S.-based firms. One of the reasons for focusing on U.S.-based companies was to reduce the amount of variation that would be derived from the research data if customer-supplier partnerships of different and multi-cultural backgrounds were studied.

The third criterion indicates that this study used 1,811 individuals as potential survey questionnaire participants. This required sample size was determined from guidelines on the sample size needed given the number of variables studied. Given the number of variables studied and the expected response rate of 10～20% based on previous studies in relationalism, the sample frame needed was more than 1,000. The last two criteria imply that this research used companies specializing in certain types of industries: SIC (Standard Industrial Classification) 35, 36, and 37, and in partnership. The three groups of industries are: SIC 35 - Industrial equipment and machinery, SIC 36 - Electronic and electric equipment, and SIC 37 - Transportation equipment. Compared to other industries, such as agriculture (SIC 01～09), construction (SIC 15～17), wholesale trade (SIC 50～51), services (SIC 70～89), and public administration (SIC 91～97), the companies in SIC 35, 36, and 37 are characterized by more business related operational and personal contacts between customer and supplier. In other words, the customer and supplier companies in the three SIC groups are more likely to build partnerships than are companies in other SIC groups.

Two sources were used to sample potential respondents of the survey questionnaire: (1) 999 managers from the *Directory of Corporate Affiliations* (1997) and (2) all 812 ASQ Customer-Supplier Division (CSD) members who work in companies that are listed in SIC 35, 36, and 37 category. For the 999 managers (each of 333 managers of buying, selling, and operations/production functions) from the *Directory of Corporate Affiliations*, a stratified sampling method was used. The whole population from the directory that falls into the first, second, and fourth of the five sample selection criteria mentioned above was already divided into smaller subdivisions on the basis of four-digit SICs. The intent in stratified sampling was to reduce sampling variability by creating a relatively homogeneous strata (Pedhazur & Schmelkin, 1991). To meet the fifth category - partnerships - the survey questionnaire instrument asked the potential respondents to choose only one company that they would consider their company's partner before answering the survey questionnaire questions.

For the 812 ASQ-CSD members, the researcher contacted the chair of the division. Eight hundred and twelve members' names and addresses falling into the first, second, and fourth sampling categories were provided by the ASQ headquarters.

4.2 Data collection procedure

There were two mailings to each of the two sources of potential survey questionnaire respondents. The survey questionnaire was mailed to 999 managers whose names were taken from the directory in the first mailing. One week after the first mailing, a follow-up call (or fax or letter)/thank-you-letter was mailed to increase the overall response rate. First, a follow-up call/fax/letter, depending on availability, asking non-respondents to answer the survey questionnaire was made/sent to all non-respondents. Second, a thank-you-message was sent to all participants in the survey questionnaire who had replied by the follow-up stage.

In the first mailing to the 812 ASQ-CSD members, the same procedures were followed and the same mailing contents were sent. In the follow-up, however, only a follow-up letter was sent to all non-respondents because their phone and fax numbers were not available. This is because a follow-up letter (vs. a follow-up call or fax) was agreed upon by the researcher and the chair of ASQ-CSD in order to protect members' privacy.

Using the procedures mentioned in this section, a total of 172 (overall response rate: 9.78%) usable surveys were returned.

4.3 Data analysis procedure

To answer the research question - *What is the relationship between tools/joint practices and shared results perceived by customer and supplier?* - the eight hypotheses in Section 2.2 were tested using a two-way or one-way ANOVA. Given no information on the interaction between two independent variables,

TQMT and PRAC, two situations were considered to test the hypotheses - (1) interaction between the two independent variables and (2) no interaction between the two independent variables - depending on the statistical significance level obtained from the two-way ANOVA.

Interaction between TQMT and PRAC

In this research, a significance level (Type I error or α value) of 0.1 was selected to test for interaction between the two independent variables before data analysis for the following two reasons. First, in examining the effect of joint action on each of the four dependent variables, it is very unlikely that any dependent variable is affected by either one of independent variables only. In this case, it is easy to make a Type I error (rejecting a hypothesis when it should not have been rejected) if the researcher uses the significance level of 0.05, which is conventional, or lower. In the context of this research, it is likely that the researcher may conclude that there is no interaction between TQMT and PRAC when, in fact, there is interaction between them because of the similar nature of TQMT and PRAC if the significance level of 0.05 or lower is used.

A second reason for using a 0.1 significance level is to prevent the unreasonably high ratios of Type II to Type I error rates that have been discussed in behavioral research. The following are two examples of discussions on why higher α value should be used to increase statistical power of survey research.

···most sociobehavioral researchers choose α by convention, usually 0.05. Although, generally speaking, there is a good reason for the selection of a relatively small α to guard against false positive findings, blind adherence to convention is clearly unwise. Suffice to point out that the consequences of false positive findings may vary greatly depending, among other things, on the area of study and the costs involved (Cowles and Davis, 1982). In the case of this research, using a significance level of 0.05 or lower may increase Type I error as mentioned above.

Given a certain response rate and fixed effect size (defined as 'the degree to which the phenomenon is present in the population' (Cohen, 1988)), increasing α may be the only feasible strategy for maximizing the statistical power of the study, 1-β (Cascio and Zedeck, 1983).

Two-way ANOVA with interaction between two independent variables

Assuming there was interaction between the two independent variables, <Table 1> could be derived using a two-way ANOVA. Then, the two-way ANOVA did the following:

(To illustrate how the two-way ANOVA was used, one of the dependent variables - mutuality - is selected as an example.)

(1) First, using scores on survey questionnaire items for TQMT and PRAC, each response's mean levels of TQMT and PRAC were determined. Then, the mean level of mutuality was calculated and this value was used as an input to the numbered area of the Table 1[(1)~(11)]. For example, if the mean levels of TQMT and PRAC were 3 and 6 respectively, then the calculated mean level of mutuality, say 4.0, was recorded in the cell indicated. (TQMT and PRAC were treated as class variables in ANOVA as follows: If 0≤ mean levels <1.5, then the value of 1 was assigned to TQMT or PRAC; if 1.5≤ mean levels <2.5, then the value of 2 was assigned to TQMT or PRAC; if 2.5≤ mean levels <3.5, then the value of 3 was assigned to TQMT or PRAC; if 3.5≤ mean levels <4.5, then the value of 4 was assigned to TQMT or PRAC; if 4.5≤ mean levels <5.5, then the value of 5 was assigned to TQMT or PRAC; and if 5.5≤ mean levels ≤6.0, then the value of 6 was assigned to TQMT or PRAC.)

(2) Using the same procedures as in step 1, mean

Table 1. Two-Way ANOVA with Interaction Between the Two Independent Variables

TQMT (Mean score) PRAC	1 (Low)	2	3	4	5	6 (High)	Average
1(Low)	(1)	(2)	(3)	(4)	(5)	(6)	μ (PRAC1)
2	(2)	(3)	(4)	(5)	(6)	(7)	μ (PRAC2)
3	(3)	(4)	(5)	(6)	(7)	(8)	μ (PRAC3)
4	(4)	(5)	(6)	(7)	(8)	(9)	μ (PRAC4)
5	(5)	(6)	(7)	(8)	(9)	(10)	μ (PRAC5)
6(High)	(6)	(7)	(8) MU:4.0	(9)	(10)	(11)	μ (PRAC6)
Average	μ (TQMT1)	μ (TQMT2)	μ (TQMT3)	μ (TQMT4)	μ (TQMT5)	μ (TQMT6)	–

Table 2. One-Way ANOVA with No Interaction Between the Two Independent Variables

Level of TQMT or PRAC	1 (Low)	2	3	4	5	6
Level of mutuality		MU:4.8				
μ[Mutuality]	μ (TQMT1)	μ (TQMT2)	μ (TQMT3)	μ (TQMT4)	μ (TQMT5)	μ (TQMT6)

scores on mutuality of all returned responses were calculated and used as inputs to <Table 1>.

(3) Mean levels of mutuality in all cells were calculated.

(4) Two-way ANOVA made a null hypothesis, H_0 : $\mu_{Cell\ 1} = \mu_{Cell\ 2} = \cdots\cdots$.

(5) Based on all mean values just calculated, the null hypothesis would be accepted or rejected by comparing the mean values in a pairwise fashion using the t- or F-test. This was done using the Student-Newman-Keuls multiple range test in Step 6.

(6) Student-Newman-Keuls (SNK: SAS User's Guide, 5th Ed.) multiple range test was conducted to determine if differences between mean values were significant such that the null hypothesis would be rejected and the hypothesized relationship between combined TQMT+PRAC and MU would be supported. To do this, the following four decision criteria were used:

① μ(TQMT1) < μ(TQMT2) < μ(TQMT3) < μ(TQMT4) < μ(TQMT5) < μ(TQMT6);

② μ(PRAC1) < μ(PRAC2) < μ(PRAC3) < μ(PRAC4) < μ(PRAC5) < μ(PRAC6);

③ μ[Average of cell labeled (1)] < μ[Average of cells labeled (2)] < μ[Average of cells labeled (3)] < μ[Average of cells labeled (4)] < ----- < μ[Average of cell labeled (11)]; &

④ No average values used in ①, ②, ③ should be grouped in more than one SNK grouping(see Table 1).

If the differences between mean values were statistically significant (or all four decision criteria were met) at an alpha level of 0.05, then the null hypothesis was rejected and the hypothesized relationship between combined TQMT+PRAC and MU was supported. Otherwise, the hypothesized relationship between combined TQMT+PRAC and MU was not supported.

(7) Using the above steps (1)~(6), all 8 hypotheses were tested.

One-way ANOVA with no interaction between two independent variables

Assuming there was no interaction between the two independent variables, <Table 1> was simplified as shown in <Table 2>. Then, the one-way ANOVA did go through the same steps as in the two-way ANOVA above.

5. Results

5.1 Results from the overall perspective

All 172 responses were used to test hypotheses from the overall perspective using the steps and procedures mentioned in Sections 4.3. (Due to the limited space, only the results derived from the overall perspective (customer+supplier) are presented here. For in-depth results derived from either the customer or the supplier perspective, please contact the researcher.) First, a two-way ANOVA was used to determine if there was any interaction between TQMT and PRAC in examining their relationship with each dependent variable. <Tables 3> through 6 show the results.

Table 3. Mean Values of INFPRT(From Two-Way ANOVA)

TQMT / PRAC	1	2	3	4	5	6
1	--	--	--	--	--	--
2	--	2.44	--	--	--	--
3	--	3.61	3.30	3.48	--	--
4	--	--	3.75	4.04	4.26	5.07
5	--	--	4.40	4.57	5.02	5.13
6	--	--	4.85	5.06	5.17	5.76
TQMT	df: 4	mean square: 1.996		F value: 13.26		p < 0.0001
PRAC	df: 4	mean square: 4.832		F value: 32.09		p < 0.0001
TQMT*PRAC	df: 7	mean square: 0.186		F value: 1.24		p < 0.2861

Table 4. Mean Values of RI(From Two-Way ANOVA)

TQMT / PRAC	1	2	3	4	5	6
1	--	--	--	--	--	--
2	--	2.60	--	--	--	--
3	--	5.40	4.17	4.00	--	--
4	--	--	3.95	4.68	4.71	4.20
5	--	--	4.28	4.54	4.97	4.87
6	--	--	4.33	4.83	5.28	5.68

TQMT	df: 4	mean square: 2.497	F value: 5.77	p < 0.0002
PRAC	df: 4	mean square: 2.635	F value: 6.09	p < 0.0001
TQMT*PRAC	df: 7	mean square: 0.619	F value: 1.43	p < 0.1971

Table 5. Mean Values of CR(From Two-Way ANOVA)

TQMT / PRAC	1	2	3	4	5	6	Average
1	--	--	--	--	--	--	--
2	--	2.71	--	--	--	--	2.71
3	--	3.29	3.29	3.19	--	--	3.24
4	--	--	3.82	3.94	3.73	4.95	3.93
5	--	--	4.57	4.65	4.78	4.62	4.70
6	--	--	4.95	5.21	5.18	5.54	5.23
Average	--	3.09	4.12	4.31	4.63	5.02	--

TQMT	df: 4	mean square: 0.688	F value: 2.65	p < 0.0352
PRAC	df: 4	mean square: 6.680	F value: 25.75	p < 0.0001
TQMT*PRAC	df: 7	mean square: 0.495	F value: 1.91	p < 0.0717

Table 6. Mean Values of MU(From Two-Way ANOVA)

TQMT / PRAC	1	2	3	4	5	6	Average
1	--	--	--	--	--	--	--
2	--	2.75	--	--	--	--	2.75
3	--	3.75	3.25	3.17	--	--	3.34
4	--	--	3.50	3.50	3.50	4.25	3.57
5	--	--	4.50	3.73	4.04	3.75	3.91
6	--	--	4.50	4.50	4.00	4.25	4.44
Average	--	3.17	3.73	3.72	3.96	4.21	--

TQMT	df: 4	mean square: 0.341	F value: 2.08	p < 0.0860
PRAC	df: 4	mean square: 2.133	F value: 13.02	p < 0.0001
TQMT*PRAC	df: 7	mean square: 0.567	F value: 3.46	p < 0.0018

Table 7. Hypothesis Testing(Two-Way ANOVA)

Hypotheses	Decision criteria 1	Decision criteria 2	Decision criteria 3	Decision criteria 4	Decision
H3 & H7	yes	yes	yes	no	**Not supported** [Organizations with higher levels of joint action (combined TQMT and PRAC) resolve conflict less formally.]
H4 & H8	no	yes	no	no	**Not supported** [Organizations with higher levels of joint action (combined TQMT and PRAC) have higher degrees of mutuality (MU).]

In the case of the relationships between the combined TQMT and PRAC and each of CR and MU, the results indicate a lack of support for the two hypotheses (see Table 7 for summary). The results from the two-way ANOVA indicate that there was no significant interaction between TQMT and PRAC in examining their relationship with INFPRT and RI. Therefore, these two hypothesized relationships were further analyzed using the one-way ANOVA in Tables 8 and 9.

To examine if differences between mean values are significant, SNK multiple range test was conducted. The results in Tables 8 and 9 and from the SNK multiple range test indicate all hypotheses were

Table 8. Mean Values of INFPRT(From One-Way ANOVA)

TQMT	1	2	3	4	5	6
μ_{INFPRT}	--	3.22	4.03	4.33	4.89	5.34
TQMT	df: 4	mean square: 7.676		F value: 25.19		p < 0.0001
PRAC	1	2	3	4	5	6
μ_{INFPRT}	--	2.44	3.42	4.15	4.81	5.22
PRAC	df: 4	mean square: 11.676		F value: 55.90		p < 0.0001

Table 9. Mean Values of RI(From One-Way ANOVA)

TQMT	1	2	3	4	5	6
μ_{RI}	--	4.47	4.19	4.57	4.97	5.01
TQMT	df: 4	mean square: 3.260		F value: 6.63		p < 0.0001
PRAC	1	2	3	4	5	6
μ_{RI}	--	2.60	4.27	4.59	4.74	5.15
PRAC	df: 4	mean square: 3.203		F value: 6.49		p < 0.0001

Table 10. Hypothesis Testing(One-Way ANOVA)

Hypotheses	Decision criteria 1	Decision criteria 2	Decision
H1	yes	yes	**Supported** [Organizations with higher levels of joint use of specific tools (TQMT) have higher degrees of informed partners (INFPRT).]
H2	no	yes	**Not supported** [Organizations with higher levels of joint use of specific tools (TQMT) have higher degrees of role integrity (RI).]
H5	yes	yes	**Supported** [Organizations with higher levels of joint practices (PRAC) have higher degrees of informed partners (INFPRT).]
H6	yes	yes	**Supported** [Organizations with higher levels of joint practices (PRAC) have higher degrees of role integrity (RI).]

supported except for the relationship between TQMT and RI. These are summarized in <Table 10>.

5.2 Summary results

Using the same steps and procedures in Section 5.1, the following summary results for the customer and the supplier perspective were obtained.

6. Conclusions

In this section, conclusions about the hypothesized relationships between independent and dependent variables are made.

6.1 Joint action and informed partners (INFPRT)

It was also found that the relationship between joint action and informed partners (INFPRT) was supported from the customer perspective (TQMT + PRAC and INFPRT), and not supported (TQMT-INFPRT) or supported (PRAC-INFPRT) from the supplier perspective. A set of conclusions can be drawn from this observation. First, organizations with higher levels of TQMT maintain either higher degrees of INFPRT or low degrees of INFPRT. This is because the combined relationship between TQMT and PRAC and INFPRT (combined H1 and H5) was supported from the customer perspective and because the relationship between TQMT and INFPRT (H1) was not supported from the supplier perspective. Second, organizations with higher levels of joint practices (PRAC) maintain higher degrees of INFPRT (combined H1 and H5: supported from the customer perspective and H5: supported from the supplier perspective).

From this finding, a conclusion is drawn as follows. To some extent, organizations with higher levels of joint action exchange not only minimal amounts of information, such as product specifications, basic prices/costs, and delivery schedules that could also be found in transaction-oriented, traditional customer-supplier relationships, but also other types of information, including technical support in substantial detail, cost reduction ideas and opportunities, and even future events and changes such as long-range forecasts of supply capabilities or demand requirements that may affect the other party.

Some tools/joint practices, such as (electronic) schedule sharing, status update, value analysis / engineering, are examples of tools/joint practices used in customer-supplier relationships before a partnership is established. However, other tools/joint practicesk such as new product introduction (early supplier involvement in design, test, and manufac-

Table 11. Summary Results for Research Question(Hypothesis Testing)

Perspectives	Hypothesized relationships							
	H1: TQMT-INFPRT	H5: PRAC-INFPRT	H2: TQMT-RI	H6: PRAC-RI	H3: TQMT-CR	H7: PRAC-CR	H4: TQMT-MU	H8: PRAC-MU
Customer	Supported (two-way)		Not supported (two-way)		Supported (one-way)	Supported (one-way)	Not supported (two-way)	
Supplier	Not supported (one-way)	Supported (one-way)	Not supported (one-way)	Not supported (one-way)	Not supported (two-way)		Not supported (one-way)	Not supported (one-way)
Overall	Supported (one-way)	Supported (one-way)	Not supported (one-way)	Supported (one-way)	Not supported (two-way)		Not supported (two-way)	

turing), manufacturability review, and sharing unusual costs, may not be expected in arm's length, traditional, and non-partner customer-supplier relationships.

To the supplier, INFPRT represents a safeguard in the sense that the customer is expected to provide unforeseen information that may affect supplier operations. This is because an expectation of getting useful information on an ongoing basis enables the supplier to cope better with the vulnerability associated with transferring decision-making control to the customer, and vice versa. The high degrees of INFPRT can only be found in customer-supplier relationships that are characterized by higher levels of joint action and partnerships.

A similar finding was found in Anderson and Weitz's (1992) study in which 378 buyer-seller dyads among five Fortune 500 companies were examined. They found that one of the key factors of joint action used in their research - specific investments - is positively related to both customer and supplier commitment to sharing strategic information. By sharing strategic information or informing each other of improvement ideas and opportunities can both parties increase quality and productivity, reduce cost, and better meet requirements and needs of the other party.

6.2 Joint action and role integrity (RI)

The hypothesized relationship between joint action and role integrity (RI) was not supported from both customer (combined TQMT+PRAC and RI) and supplier perspectives (TQMT-RI and PRAC-RI). In other words, both customer and supplier organizations with higher levels of joint action do not maintain high degrees of RI.

In theory, RI is described as follows: the more discrete the transaction (*or* the more the relationship is based only on business transactions), the more simplistic become the roles to be maintained by both parties (MacNeil, 1983). By contrast, relational exchange, or partnership, requires the parties to maintain highly complex and multi-dimensional roles (MacNeil, 1980 and 1978). In the context of this theory on RI, no support for the hypothesis, particularly from supplier perspective, can be explained by the suppliers' tendency to maintain a long-term relationship with multiple source partners. In other words, if suppliers prefer maintaining multiple sources of partners to maintaining a single source, they are likely to rely on other sources of partners which, in turn, results in lower degrees or uni-dimensional role complexities as well as lower level of continuity expectations of the customer.

A similar point was made in Hu and Chen's (1993) study where the degree of joint venture, which is considered a part of role integrity, was examined with respect to socio-cultural distance between partners. They found that firms seek low degrees of joint venture under conditions of high socio-cultural distance. In the context of this research, it is likely that both parties experience higher degrees of socio-cultural distance, or low degrees of role integrity, if suppliers maintain a relationship with multiple customers than when they establish a partnership with only a few (or single) customers.

6.3 Joint action and conflict resolution (CR)

From the hypothesized relationships between joint action and conflict resolution (CR), it is concluded that customers and suppliers have different perceptions about this particular shared result dimension. For example, the hypothesized relationships TQMT-CR and PRAC-CR were supported from the customer perspective, which means that as the use of joint tools and practices increases, customers perceived that conflicts were resolved less

formally. On the other hand, from the supplier perspective, higher levels of joint action were not found to be associated with more informal conflict resolution.

Osborn and Baughn (1990) made a point that is moderately aligned with the supplier perspective in this research. In their study where the relationship between environmental uncertainty and contractual agreement was examined using 153 U.S.-Japan alliances, they found that alliances are likely to be governed by contractual agreements under conditions of environmental uncertainty. In the context of this research, the use of contractual agreement, which is considered a formal mechanism to do business, or resolve conflicts, is likely to increase if customers feel uncertain, or insecure, future relationship with their suppliers. This is true especially when suppliers tend to maintain a relationship with multiple sources of other customers.

6.4 Joint action and mutuality (MU)

The hypothesized relationships between joint action (TQMT+PRAC) and MU and between each TQMT and PRAC and MU were not supported from the customer and supplier perspective respectively. Higher levels of joint action did not seem to be associated with higher levels of mutuality from the both perspectives. It appears that organizations, especially customer organizations, are not willing to equally distribute cost savings and other benefits from the relationship with suppliers. However, different findings are identified by Bucklin and Sengupta (1993) and Heide and John (1988). These two studies found that specific investments, which is one of the key factors of joint action, is positively related to the degree of equal sharing of benefits and expenses over the long-term business transaction horizon.

The following two major findings from relationalism studies are selected to compare findings from this research. First, in their study in examining associations with strength of buyer-seller relationships (relationalism) and alternative governance structures (market, administered, franchise, and corporate), Boyle *et al.* (1992) identified that the frequency of recommendations, promises, and information exchange is associated positively with a global measure of relationalism. In the context of this research, frequent recommendations, promises, and information exchange can be considered as a set of tools/joint practices contributing to informed partners (INFPRT). In addition, the relationship between joint action and INFPRT was found in this research to be supported by customers. Therefore findings in this research about the relationship between joint action and INFPRT are in agreement with findings from Boyle *et al.*

Second, Heide and John (1992) showed norms (defined by them as *expectations about behavior that are at least moderately shared by a group of decision makers*) play a very significant role in structuring economically efficient relationships between independent firms. In context of this research, norms can be considered as expectations anticipated by each party in terms of sharing/providing information/suggestions for INFPRT, multi-dimensional and more complex roles (RI), or even sharing of benefits and cost savings fairly (MU). However, some findings from the hypothesized relationships between joint action and these three shared results dimensions do not align with Heide and John's assertion. This may be caused by the different research settings selected by Heide and John such as: (1) different scale (buyer control, buyer-specific assets, norm of solidarity, etc.) and survey items (2) different data source (OEM manufacturers and their component suppliers from SIC 35, 36, and 37), and (3) different research objectives and questions.

7. Discussion

This research is the first attempt of which the researcher is aware to explore the shared results of joint action between customer and supplier organizations to build and expand knowledge on better SCM systems. In doing so, the researcher has attempted to deal with a set of four shared results dimensions as dependent variables. It is also the first attempt of which the researcher is aware to treat integrated shared results dimensions as a set of dependent variables that are different from approaches used by those in the relationalism area. However, the findings and conclusions drawn from this research should be viewed in the light of the research focus used. Although the answers to the research question yield several results that are consistent with other studies, the fact that a partnership between customer and supplier organizations was used limits the ability to rule out alternative causal inferences on general customer-supplier relationships. Because a partnership implies

that several key factors, such as two-way communication, specific investments, and trust, exist between two parties as pre-requisite conditions, alternative causal inferences can be found in non-partner type customer-supplier relationship in which more business transaction-oriented factors govern the two parties' relationship.

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Appendix A: Final Survey Questionnaire

(i) I am completing this survey as a major Customer (Buyer) ____ Supplier (Seller) ____ of our partner.
(ii) What is your title?
(iii) How many years' experience do you have in this job?
(iv) How many years' experience do you have in this organization?
(v) How long has your company been in business with this particular partner?
(vi) What is your company's average total annual sales volume?
(vii) What is the total number of employees in your company?
(viii) Is your facility part of a larger parent organization?
(ix) Is this partner the single source customer/supplier for parts or components? Yes ____ No ____
(x) What percentage of sales (if you are the supplier) or purchasing (if you are the customer) are accounted for by this partner?
(xi) What is the size of the customer or supplier that you have chosen as your partner in terms of the total number of employees?
(xii) Of all your company's relationship with customers and suppliers, what proportion would you characterize as partnerships?

Joint use of specific tools: 5 items: α=0.71
(1) We are using specific tools with our partner to jointly design new products.
(2) People in the two companies use mechanisms or tools to design better quality systems.
(3) The relationship with our partner involves the use of quality tools for longer term planning.
(4) Our partner is involved in joint planning activities with us that traditionally were considered only one party's responsibility.
(5) The relationship with our partner includes formal evaluation and assessment.

Joint practices: 4 items : α=0.65
(6) In the relationship with our partner, there is an exchange of strategic information, such as cost and price structure.
(7) The relationship with our partner involves frequent personal contacts for exchange of ideas and information.
(8) We are willing to put aside contract terms in order to jointly work through difficult technical or quality problems that arise.
(9) The relationship could be described as a 'long-term joint venture' or partnership.

Informed partners: 9 items : α=0.81
(10) Our partner shares information to help our company increase quality and productivity.
(11) We provide each other with technical support in substantial detail.
(12) Our partner helps us identify cost reduction opportunities.
(13) Both parties share information on performance in meeting the expectations and needs of the other.
(14) Our partner offers specific suggestions to help us improve our processes and procedures.
(15) Our partner is responsive in maintaining a cooperative relationship with us.
(16) The relationship with our partner includes diverse expectations over many issues.
(17) We keep each other informed about events or changes that may affect the other party.
(18) We regularly provide our partner with long-range forecasts of supply capabilities or demand requirements.

Role integrity: 5 items : α=0.69
(19) We have made financial investments in our company, such as tooling, equipment, and training employees, dedicated to the relationship with our partner.
(20) If our relationship with our partner were discontinued, our sales would suffer.
(21) From time to time, we are willing to make sacrifices to help our partner.
(22) Both parties have multi-dimensional roles that go beyond the mere buying and selling of products.
(23) We are responsive in maintaining a cooperative relationship with our partner.

Conflict resolution: 7 items : α=84
(24) Problems that arise in the course of this relationship are treated as *joint* rather than *individual* responsibilities.
(25) Each conflict is treated as a further improvement opportunity.
(26) Neither party abuses its power over the other party.
(27) Rather than relying on legal procedures to resolve conflicts (i.e., filing a suit), both parties rely on more informal means.
(28) Temporary setbacks in our partner's performance commitment are accepted and resolved in an aligned and negotiated way.
(29) The relationship with our partner can be characterized as flexible.
(30) Our partner is flexible in response to requests we make.

Mutuality: 4 items : α=0.85
(31) Our company gets a fair share of the financial rewards and cost savings from the relationship with our partner.
(32) Benefits from problem solving with our partner are shared jointly.
(33) Both parties are committed to improvement that benefits the relationship as a whole, not just the individual parties.
(34) There is a strong spirit of fairness in the relationship with our partner.

(35) *First*, identify the impact of using tools or joint practices by specifying a *percentage increase* or *decrease*. *Second*, identify only tools/practices that are predominantly responsible for the percentage increase/decrease in quality, cost, cycle time, and other performance dimensions.

Performance Dimensions used	Impacts +: Increase -: Decrease	Tools/joint practices
Quality	( )% +/-	.....
Costs	( )% +/-	.....
Cycle time	( )% +/-	.....
Overall	( )% +/-	.....

(36) Overall, my level of satisfaction with this partner is very high.
(37) Overall, the quality of the partnership with this partner is very high.

Customer-Supplier Partnership Survey
[Survey items #1-34, 36, and 37 are answered using 6 point ordinal scales: 1 - Strongly disagree, 2 - Disagree, 3 - Somewhat Disagree, 4 - Mildly agree, 5 - Agree, and 6 - Strongly agree]

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