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Developing a Model for Identification of the Effect of Knowledge Levels on Supply Chain Performance

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Abstract

Twenty first century is described by knowledge development and its effect on all organizational dimensions. Today, knowledge is considered as the key and sometimes the only source of competitive advantage for organizations; that is why managers and organizations focus on utilizing some methods for knowledge acquisition, storage, and knowledge application in the present dynamic and competitive environment to provide access and quick transfer of knowledge in system using knowledge management. Therefore, the present research intends to present a model for identifying the effect of knowledge level on supply chain performance using modeling structural equations. Research statistical population included all automotive industries in Iran such as component makers, sale representatives, manufacturing units, etc. 350 were randomly selected as research sample and a questionnaire was distributed, 240 of which were returned. Finally, the positive, significant effect of business attitudes, organizational memory and individuals' knowledge on supply chain performance in Iran automotive industry was maintained; whereas, the positive, significant effect of customer knowledge, beneficiaries' relationships, knowledge in processes, and knowledge in manufacturing and services was rejected.

Keywords: Knowledge, supply chain, supply chain performance.

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Introduction

In past, traditional supply chains focused on cost and factors such as flow of materials and components, information flow, and cash flow. But, today, it is necessary to faster supply market need. At such condition, the key to survive is the competitive advantage comparing rivals. On the other side, competition necessarily demands improved performance and supply chain as new age phenomenon may not be excluded. Now, scholars concentrated on recognizing that how knowledge leads to different performance in supply chain and finally to competitive advantage for the organization. Knowledge in supply chain correlates various results (outcomes) like reduced cycle time, proper source utilization, access to facility, as well as cooperation (Jafarnezhad et al, 2013). Of these, automotive industry may not be excluded from the rule of change, competition, and various customer demands; it has always been of the most complicated management issues and difficulties due to extended supply chain often including several hundred suppliers and supplying several thousand parts (components) such that any attempts of performance improvement, whether at national or global level, may bring great triumphs for other industries. Improper perception of customer need, lack of proper knowledge trend among supply chain partners in addition to absence of suitable solutions of competitors' analysis are now of the issues caused decreased efficiency of automotive industry. Therefore, regarding high competition in automotive industry and customer preference variety, automotive corporations may call for a model to study various knowledge levels in supply chain. Thus, lack of any study prioritizing knowledge levels made scholars to study knowledge levels and its key activities and to develop a model for identifying the effect of knowledge levels on supply chain performance in order to improve supply chain performance in automotive industry.

Theoretical basics and research background

Today, knowledge is largely interested as a critical success factor to achieve and maintain competitive advantage in an organization (Lee and Lan, 2011; Liu and Deng, 2015) and traditional approaches due to source-based economy rather than knowledge-based economy are no more important (Crone and Roper, 2001; Tseng, 2009).

Davenport and Purshak (1998) defined knowledge as a combination of experience, values, information, and attitudes of experts suggesting a framework for assessing and integrating new information and experiences (Davenport and Purshak, 1998). According to another interpretation, knowledge is consisted of a set of facts obtained by experts over years of work and experiences (Leibowitz, 2001).

Research results demonstrated that knowledge transfer may improve supply chain performance; further, the interaction between competition culture and knowledge development is positively related to supply chain performance. In general, there are seven knowledge levels recognized for organizations as follows:

- **Customer knowledge:** this knowledge level helps the organization to identify its customers and effectively target.

- **Beneficiaries' relationships:** groups such as shareholders, customers, employees, and suppliers are considered as organizational beneficiaries. Comprehensive exploring and monitoring of their contributions in organizational strategies and activities are of basic steps of strategic planning.

- **Business attitude:** organizations operate in complex contexts and to succeed and survive in different business arenas it is necessary to recognize the surrounding. In addition, observing rivals' business status is of critical activities in competition, too.

- **Organizational memory:** it referred to a set of information, rules and regulations, and guidelines any organization requires. Indeed, organizational memory is the place where all organization beneficiaries refer such that a comprehensive recognition of the organization and business is explained (Gupta and Sharma, 2004).

- **Knowledge in products and services:** today, knowledge-based products and service delivery are regarded as the main factors of competition and survival in organization.

- **Knowledge in processes:** In fact, it is integration of management area of business processes and decision-making area in process implementation to knowledge management area (Ranjbarfard, 2013).

Knowledge in individuals: organizations are supposed to provide a knowledge sharing, transferring and contrast context among members to direct individual knowledge toward organizational objectives (Nonaka and Takeuchi, 1995) and to train people along conceptualized interactions. The most successful organizations are those in which knowledge management is a working constituent of employees (Nonaka, 1995).

Table 1: Knowledge levels in an organization (Gupta and Sharma, 2004)

Customer knowledge	- Developing knowledge sharing- based deep relations - Perceiving customer need
Beneficiaries' relationships	- Improving knowledge flow among suppliers, employees, beneficiaries, and community - Applying this knowledge formulating key strategies
Business attitudes	- Systematic environmental exploration including political, economic, technological contexts, social and environmental trends - Analysis of the competitors - Market intelligent systems
Organizational processes	- Knowledge sharing - Databases of the best experiences - Online documents - Domains of discussion, disputes and internet

Knowledge in processes	- Directing knowledge toward business process - Knowledge directing in decision-making
Knowledge in productions and services	- Knowledge-based service delivery - Products surrounded by knowledge
Knowledge in individuals	- Knowledge sharing gatherings - Innovation workshops - Learning networks - Knowledge and information technology associations

To achieve macro objectives of the organization, it is necessary to evaluate supply chain in different areas from performance point of view (Taebi and Pilevari, 2015). According to the conducted studies, supply chain performance dimensions and proposed sub-factors by researchers are illustrated in Table 2.

Table 2: Variables of supply chain performance

Dimensions	Sub-factors	Source
Cost performance	1. Cost of per unit product comparing to the competitors 2. Purchase cost of materials and parts from suppliers	(Pilevari. 2009)
Source performance	1. Storage costs 2. Each source surplus (%) in a given time period	(Cai et al, 2009)
Quality performance	1. Customers' complaints 2. Quality of materials purchased from suppliers	(Shafiee & Lotfi, 2014)
Flexibility performance	1. Supply chain accountability 2. Flexibility in manufacturing (product variety)	(Dixon, 1992; Cai et al, 2009; Shafiee & Lotfi, 2014)
Delivery performance	1. On time order delivery 2. Delivery speed comparing the competitors	(Pilevari, 2009; Shafiee & Lotfi, 2014; Choi & Eboch, 1998)
Innovation performance	1. New products over a given time period 2. Organization investment level on research and development	(Chan, 2003)

In the following, research hypotheses of positive effect of identified components on supply chain performance are defined and explained.

H_1: *Customer knowledge has a positive and significant effect on supply chain performance.*

H_2: *Beneficiaries' relationships have a positive and significant effect on supply chain performance.*

H₃: *Business attitudes have a positive and significant effect on supply chain performance.*

H₄: *Organizational memory has a positive and significant effect on supply chain performance.*

H₅: *Knowledge in processes has a positive and significant effect on supply chain performance.*

H₆: *Knowledge in productions and services has a positive and significant effect on supply chain performance.*

H₇: *Knowledge in individuals has a positive and significant effect on supply chain performance.*

Materials and methods

This is an applied-descriptive research in terms of nature and method, as it describes the variables and their relationships. It is a correlation study since it tests and explains simultaneous relationships among variables using correlation analysis and structural equation model. According to the aforementioned definitions and literature review, the conceptual model in Figure 1 was obtained for the relationship between knowledge levels and supply chain performance.

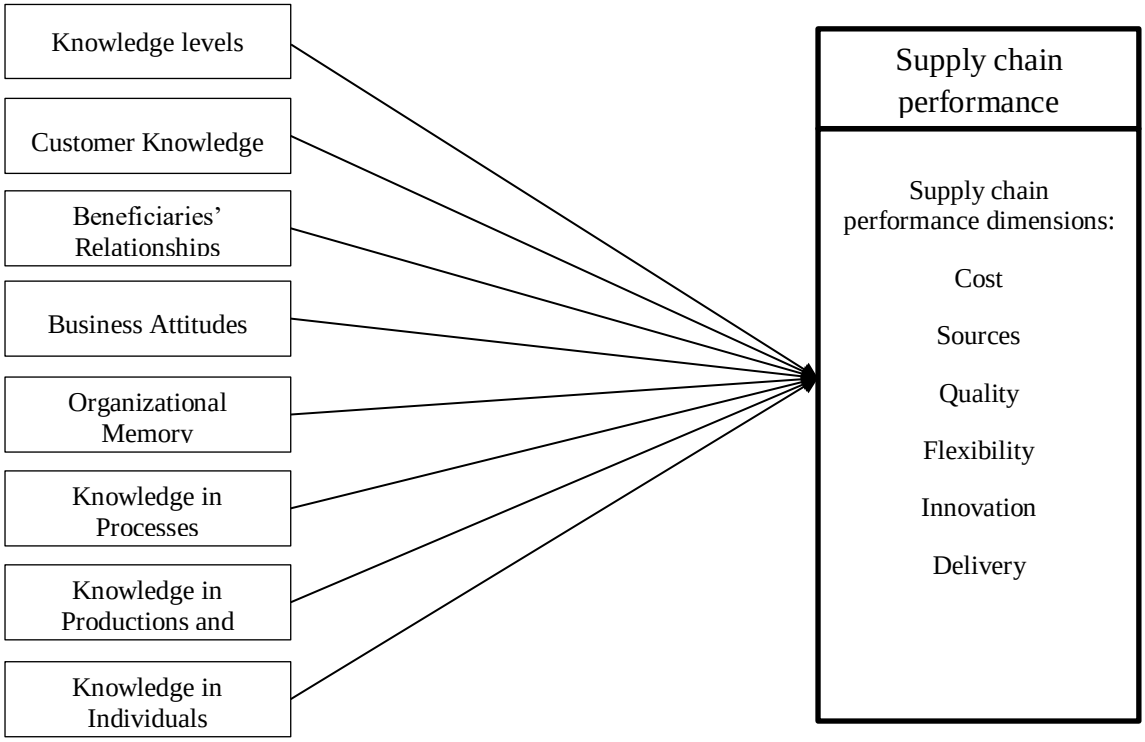

Figure 1: Research researcher-made conceptual model

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Therefore, research main hypothesis is to identify the effect of knowledge levels on supply chain total performance in Iran's automotive industry.

Research statistical population included all supply chain partners in Iran automotive industry including manufacturers, sale representatives, and manufacturing units. 350 were randomly selected as research sample and a questionnaire was distributed, 240 of which were returned for analysis.

Test reliability was verified using Cronbach's alpha coefficient, where it obtained 0.844 and 0.896 for knowledge levels and supply chain performance, respectively, which were larger than 0.7.

Respecting to validity of measurement instrumentations, since research conceptual model stemmed from literature and confirmed by five professors and experts; thus, surface validity is verified. Moreover, model validity was also verified by confirmatory factor analysis through LISREL software. Of multiple fitness factors of factor analysis model RMSEA $\leq$ 0.1 and GFI $\geq$ 0.9, NFI and AGFI were the most known sufficiently determine fitness of confirmatory factor analysis model.

Results of confirmatory factor analysis of research variables by LISREL software are provided as follows. Figure 2 represents confirmatory factor analysis of knowledge level variables indicating significance of all coefficients.

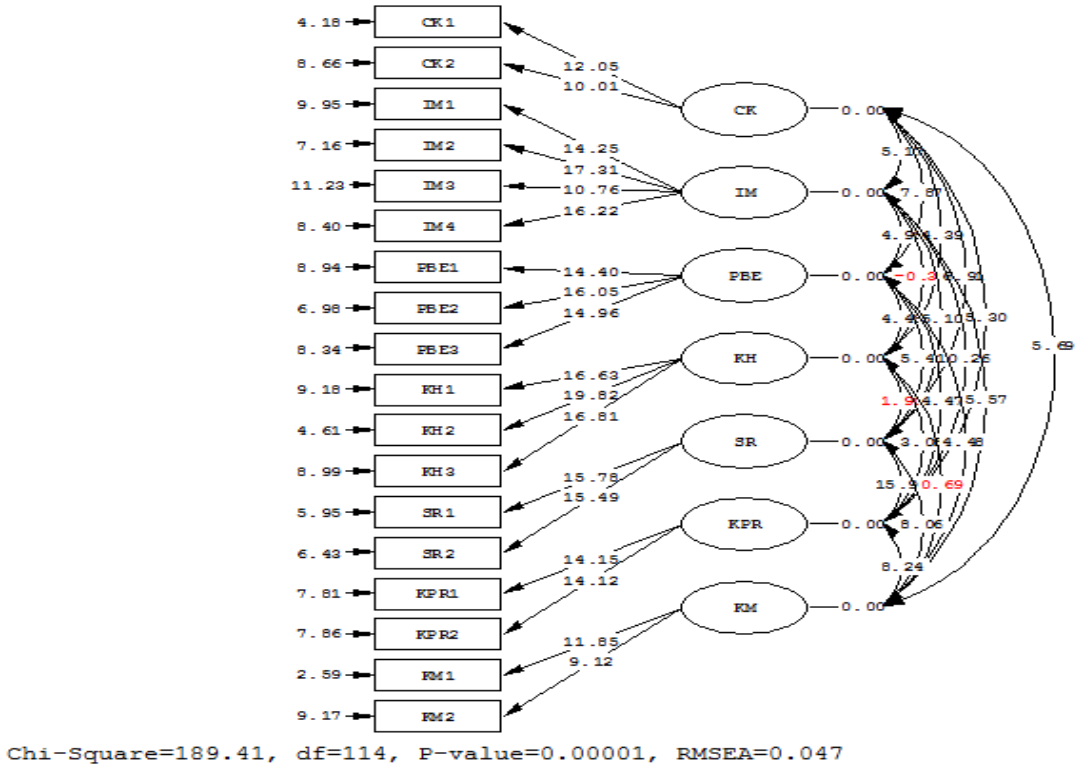

Figure 2: Confirmatory factor analysis of knowledge level variables at significance level

Figure 3 shows confirmatory factor analysis of knowledge level variables at standard estimation.

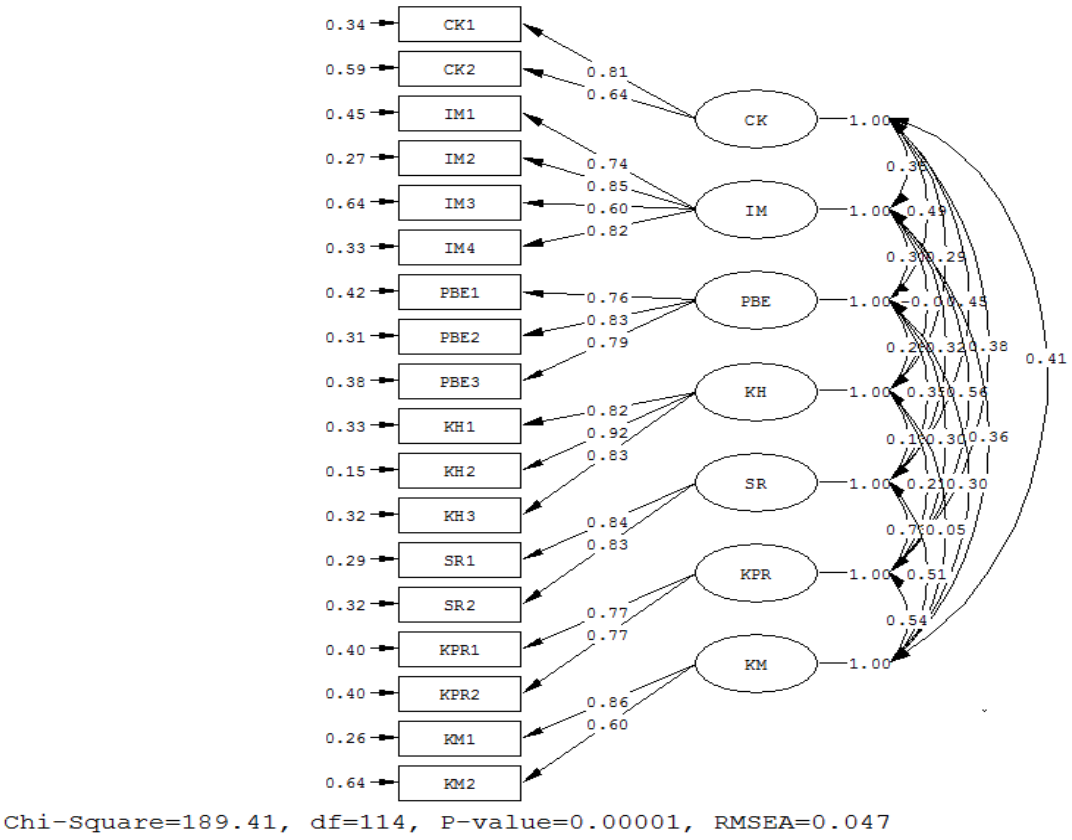

Figure 3: Confirmatory factor analysis of knowledge level variables at standard estimation

Model factor loadings at standard estimation demonstrate the effect of variables or items on explaining score variance or main factor. In other word, factor loading shows the correlation of any observable variable (questionnaire item) with latent variable (factors).

Estimation results (lower part of the figure) indicate factors' relative fitness. According to LISREL output, X^2 obtained 189.41, which is smaller than 3 comparing degree of freedom (114). RMSEA is also 0.047 that may not exceed 0.1. AGFI, GFI and NFI are 0.92, 0.96, and 0.96, respectively signifying proper fitness. Furthermore, as factor loadings are larger than 0.5, the model shows a convergent validity. Results of confirmatory factor analysis of latent variable are provided in Table 3.

Table 3: Results of confirmatory factor analysis of supply chain performance in supplies

Constructs	Model code	Standard estimation	T
Cost performance	COST.P1	0.74	13.66
	COST.P2	0.87	16.53
Source performance	RES.P1	0.78	14.69
	RES.P2	0.8	15.21
Quality performance	QUA.P1	0.76	14.42
	QUA.P2	0.86	16.95
Flexibility performance	FLE.P1	0.80	15.23
	FLE.P2	0.77	14.60
Delivery performance	DEL.P1	0.73	13.04
	DEL.P2	0.87	15.73
Innovation performance	INO.P1	0.83	15.83
	INO.P2	0.81	15.19

Moreover, all fitness factors were acceptable. Since factor loadings are larger than 0.5, models benefited convergent reliability.

Findings

Research hypotheses were analyzed using structural equations through LISREL software. Null and alternative hypotheses are as follows:

H_0= There is no significant relationship between the two variables.

H_1= There is a significant relationship between the two variables.

If significance of t-test is larger than 1.96 or smaller than – 1.96, null hypothesis is rejected and alternative hypothesis of significant relationship is maintained (hypothesis maintained). In case that significance of t-test is between 1.96 and – 1.96, the alternative hypothesis is rejected and null hypothesis of no significant relationship is maintained (hypothesis rejected).

Supply chain structural model is discussed in the following at standard estimation and significance coefficients. Figures 4 and 5 show the effect of exogenous latent variable (knowledge levels on endogenous latent variable (supply chain performance).

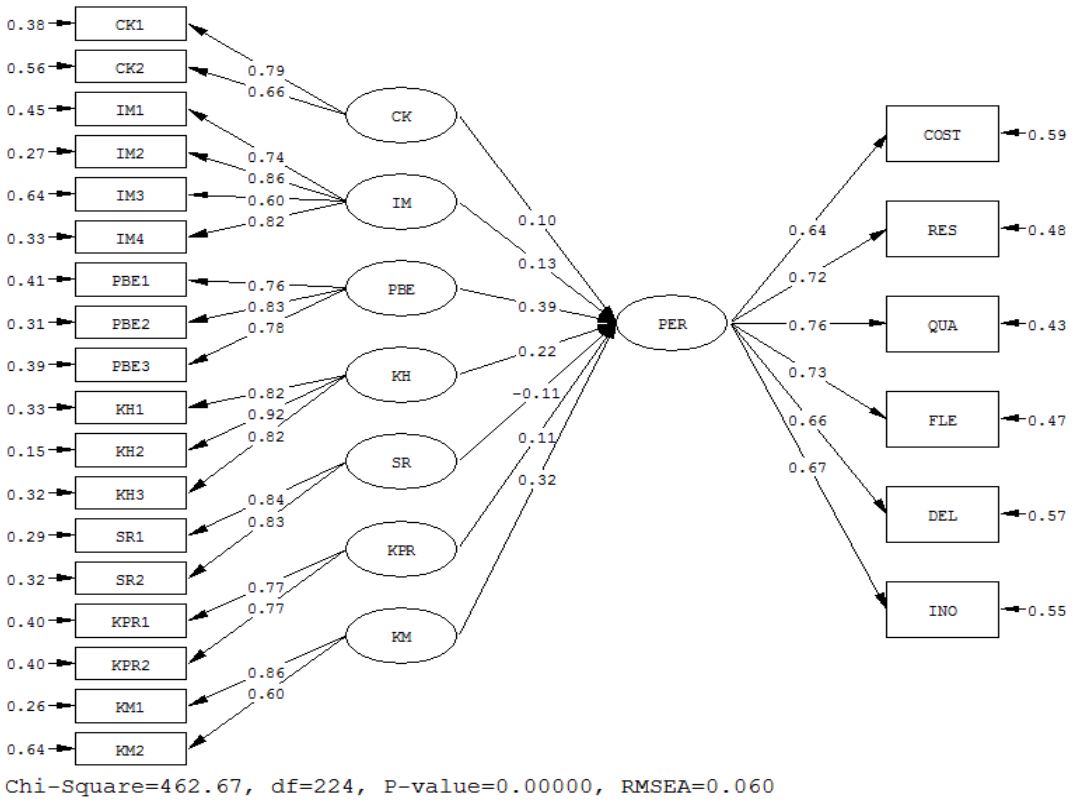

Figure 4: Structural model of supply chain performance at standard estimation

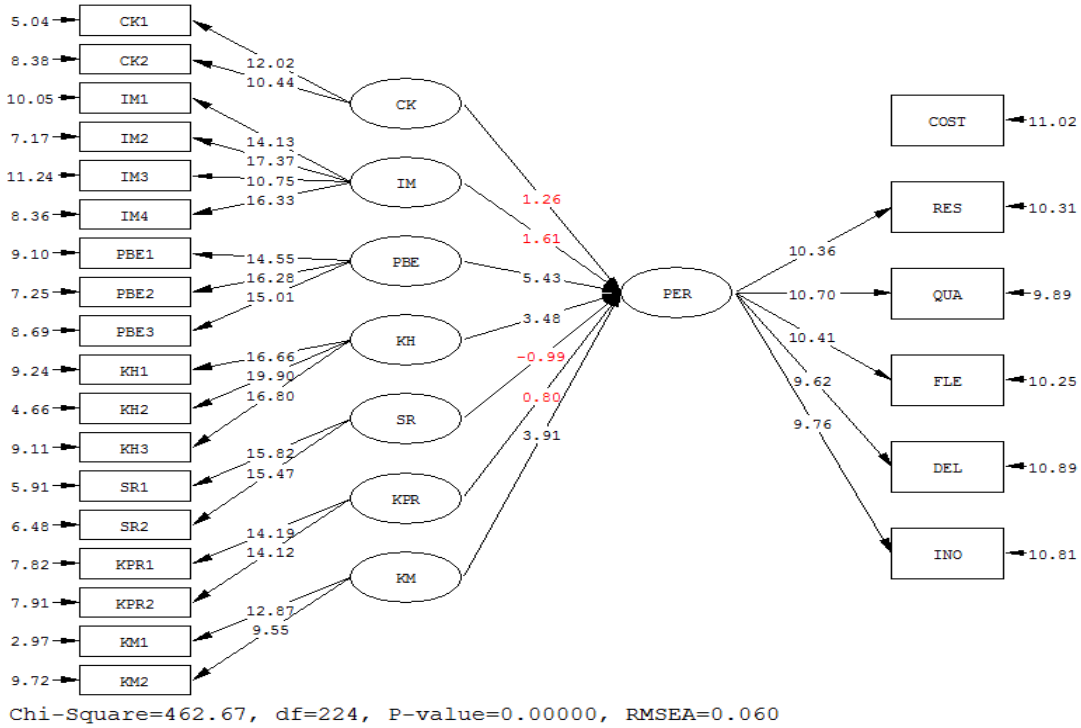

Figure 5: Structural model of supply chain performance for significant coefficients

Table 4 summarizes that the relationships among research variables are rejected.

Table 4: Rejecting or maintaining research variables' relationships

Research hypotheses	Effect	Significance	Result
Customer knowledge has a positive and significant effect on supply chain performance.	0.10	1.26	Rejected
Beneficiaries' relationships have a positive and significant effect on supply chain performance.	0.13	1.61	Rejected
Business attitudes have a positive and significant effect on supply chain performance.	0.39	5.43	Maintained
Organizational memory has a positive and significant effect on supply chain performance.	0.22	3.48	Maintained
Knowledge in processes has a positive and significant effect on supply chain performance.	-0.11	-0.99	Rejected
Knowledge in productions and services has a positive and significant effect on supply chain performance.	0.11	0.80	Rejected
Knowledge in individuals has a positive and significant effect on supply chain performance.	0.32	3.91	Maintained

According to LISREL output, X^2 was measured 462.67, which is larger than 3 comparing degree of freedom (224). RMSEA= 0.060 also implies that the structural model is properly fitted. In a better word, observed data are largely consistent to research conceptual model. AGFI, GFI, and NFI were calculated 0.85, 0.89, and 0.94, respectively revealing model relative fitness.

Conclusion and recommendations

As seen in the abovementioned tables, business attitudes, organizational memory, and individuals' knowledge influence supply chain performance by 0.39, 0.22, and 0.32, respectively. Positive path coefficient also shows convergent changes; indeed, the more the factors in the organization are, the higher effectiveness of the supply chain performance is. Furthermore, other factors of customer knowledge, beneficiaries' relationships, knowledge in processes, and knowledge in productions and services showed no significant effect on supply chain performance.

Regarding research findings, it is recommended that organizations largely focus on business attitudes including analyzing the competitors at national and international markets. Proper information may be obtained by interviewing customers about rivals' products. Moreover, active organizations of automotive industry intended to improve supply chain performance may create information technology-based organization concentrated on re-architecting, provide necessary infrastructures, and may improve intra-organization communication for organizational knowledge management. In addition, they may also develop cultural infrastructures of information-oriented corporations to share the knowledge between and beyond organizations, which is an

introduction to knowledge enhancement. Furthermore, the organizations are supposed to recruit knowledge-oriented individuals and experts in various sectors, produce qualification matrix, and to formulate precise occupational programs for knowledge requirement and knowledge creation.

Since communication and information technology is a new concept, it is recommended that further studies specifically and individually investigate effective factors of communication and information technology required for knowledge sharing among supply chain partners. Moreover, it is also suggested that more data are collected or the proposed model is tested through other methods to verify model validity.

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