



## A Qualitative Research on Strategic Performance of Supply Chain in the Automotive Industry

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### KEYWORDS

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NPD.

### ABSTRACT

Nowadays, automakers have faced complexity of supply chain that led them to improve procedures and processes in order to ensure high performance at both strategic and operational levels. The main purpose of this research is to develop strategic performance of supply chain (SPSC) including information technology (IT), organizational learning (OL), and Product innovation (PRI) via qualitative research. In fact, this research explains how these factors affect SPSC. Irankhodro Company (IKCO) as the biggest automaker in Middle East is our case study in order to conduct research and develop a model to explore the phenomena and events associated with the strategic performance of this SC. A total number of 12 interviews were done based on a list of semi-structured open-ended questions in order to evaluate constructs and models. The development of constructs in IKCO according to respondents' opinions was classified into three categories including high, medium, and low developed levels. In the high-developed level, IT has been developed in IKCO more than another constructs consisting of development of ORACLE system, SAP, and KANBAN in order to cover information, procedures, and processes across supply chain. While SPSC construct as a dependent variable has been developed less than others. The main research contribution is to develop SPSC model at first in the automotive industry. The another contribution is a common strategy matrix to illustrate common strategies between IKCO and key suppliers as shown in Table 5 to acquire high performance at the strategic level.

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### 1. Introduction

Since 1980s, the automotive industry has developed supply chain to decrease managerial

loads and production costs [14]. Supply Chain Management (SCM) consists of approaches and strategies to integrate suppliers, producers, and all external actors to enhance organizational performance in a long-term period. Finally, Supply Chain Management (SCM) is an integrated organization as a business model

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characterized by high performance [2]. It is one of the most important issues in industries, especially in the automotive industry. Complexity of the supply chain due to complexity of the automotive components and technology caused the automotive firms to find methods for improving and promoting performance [11]. Therefore, automotive industries have contributed to the creation of the value chain by developing supply chain. They have faced some challenges such as limitation of pricing, on-time delivery, quality, customer services, environmental subjects, product life cycle, and new-product development, time to market, production costs, and chains' relationships in the competitive atmosphere. Some automakers do not have a clear mission, a powerful vision, available long-term goals, and competitors' information in order to analyze competitive atmosphere and new product development. In addition, uncertainty in market atmosphere, competitors' information, and inability of on-time decision-making lead firms toward to make wrong decisions. Then, it is important to investigate strategic performance of the supply chain. This study provides theoretical,

practical, and managerial implications and vital instruments to access high strategic performance for the first time in the automotive industry. Practical implications involve developing IT, PRI, OL, and SPSC at operational and managerial levels.

**1-1. The supply chain of IKCO**

In IKCO, according to annual, six-month, and monthly plans, the week plan is prepared and ordered to SAPCO for supplying parts and sets. According to Figure 1, the orders are done by ORACLE and KANBAN systems. IKCO and SAPCO are linked by ORACLE, and orders are issued to suppliers by ORACLE software via SAPCO. The orders for suppliers are announced using KANBAN system in SAPCO to determine how many, what date, and what time products are to be delivered to IKCO's warehouses. The main suppliers have a username and a password to ORACLE system to check orders, inventory level of parts in IKCO's warehouse, financial status, and even dates of payment [^].

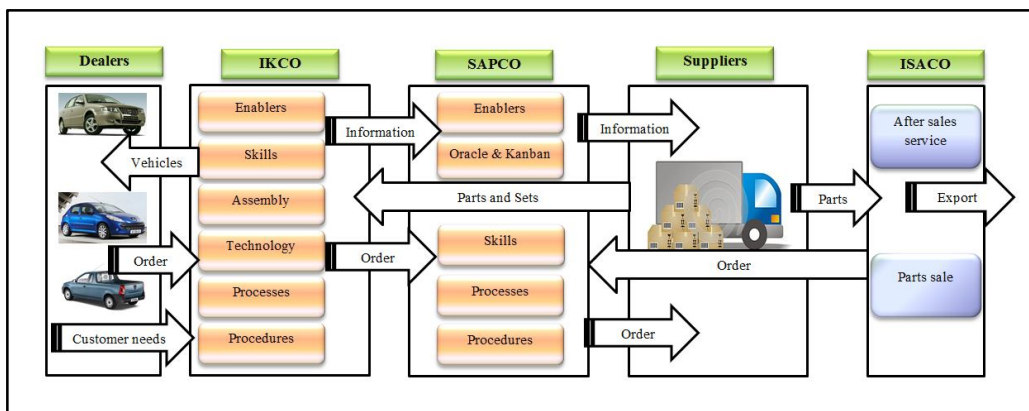


Fig. 1. The supply chain schematic of IKCO adopted by (Gholamreza & Abul Rahman, 2016)

SAP (as ERP) has been utilized at IKCO a few years ago to integrate all chains while, still, it is being used at IKCO. SAPCO seeks to develop IT infrastructure using SAP of IKCO to develop it across local and foreign suppliers. IKCO encountered some challenges in the field of the strategic performance across supply chain.

**1-2. Strategic performance of the supply chain**

Some past studies have emphasized the factors associated with NPD. Many investigations illustrate a new product development as one of

strategic performance dimensions. One of the most important issues of strategic performance is to measure firm performance in developing new products. In fact, performance indicators of NPD include the number of new product in different durations, time to market of new product, and product's life cycle. About 25% of the first life cycle of each product corresponds to the short-term period, and the remaining 75% corresponds to the long-term period. Supply chain management is aimed at achieving convergence of inter- and intra-organizations' techniques and

tactic capabilities as a unified organization [6]. In addition, they seek to synchronize all the relevant activities among chains. It is difficult to synchronize and converge activities because the chains have managerial independence and need to be linked. Therefore, it is important to understand the processes and instruments before making connection with each other.

There are two approaches to strategic decisions including centralized and decentralized decisions. Whereas decentralized strategic decisions involve all departments, information technology has an effective role in decision-making by departments. Speed, quality, accuracy, and reduction of transaction costs are the outcomes of information technology [10]. Management information system as one of the outcomes of IT includes transaction processing system (TPS), decisions support system (DSS), and executive information system (EIS). Information flows down to up and up to down. TPS covers operational levels such as line production, warehouses, quality procedures, and all routine and repeatedly data; DSS covers mid manager level to make decisions, and EIS covers the top manager. Strategic decisions are made at the executive level using information of MIS, TPS, and DSS, flowing across organizations. Therefore, IT has positive effect on strategic performance [21].

In this study, some indices were surveyed to measure dimensions of strategic performance, including vision, mission, long-term goals, competitors' information for NPD, and on-time strategic decision-making for NPD. One of the most important issues of the automotive industry is to organize strategic planning in the field of a new product development as long-term goals. Deming, in the late 80s, utilized "profound knowledge" to explain the importance of providing necessary knowledge for managers and workers in order to plan and implement decisions systematically. These activities are utilized to enhance capabilities and skills. He emphasized the role of psychology in understanding people's needs. Learning process is done via acquiring knowledge and information, related to improving quality, processes, procedures, new product development, etc.

Knowledge and information are similar blood types in vital vessels of livings, which need to flow across firms' body. Occupational knowledge improves work quality, especially in technical jobs. Rapid changes in technology indicate the significance of knowledge sharing across supply chains. Therefore, focal firms

should share information and knowledge among chains to develop learning. It has more than two decades that computerization of information flow has been rapidly progressing due to rapid technological advances; such digitalized information flow is used in a broad variety of tools to organize transactions, improvement of decision-making, and speed up information flow. Therefore, often, by using particular software systems (e.g., SAP, ORACLE, and ERP) and market-oriented system, firms improve their inter-organizational relationships through learning [23] and effective interaction.

### **1-3. New product development**

Around 20 years ago, automotive companies and suppliers have increased product innovation. Indeed, they rapidly develop new products to fill gaps in market. The Iranian automakers have encountered some challenges to access new products by innovation such as repetition, reliability, fast nature, profitability of innovation projects, and quality, which R&D centers could not solve them [3].

Customer firms can reap benefits by including suppliers in NPD activities (product innovation, time-to-market, product quality, production cost, or development time and development cost) rather than when they work independently. Furthermore, this strategy can help conserve resources, share risks, gain new competencies, and move faster into new markets. One of the most important issues of strategic performance is to measure firm performance in developing new products. In fact, performance indicators of NPD include the number of new products in different time series, time to market, pricing, and long-term goals to develop new products. In a study, researchers emphasized the positive relationship between mission quality and financial performance help to develop performance indicators. He pointed out that mission components consist of products, main technology, location, financial objectives, and organization philosophy [21]. The key chains, such as key suppliers and customers, should be involved in field of vision, mission, long-term goals, and new product development. Companies should try to develop new products in order to consider needs of the market and customers toward competent attendance in the market [18].

### **1-4. Organizational learning (OL)**

Drucker (2016) emphasized that knowledgeable employees are vital assets and components of a

successful organization [4]. Employees' skills are attained via training and experience. In fact, it is the degree of learning, which employees can do their functions accurately and on time. Mohnen and Van (2017) emphasized that employees' skills are an important factor in innovation. In their study, they proved that the lack of skills in many industries was the most important barrier to innovation [19]. In fact, organizational learning is processed systematically in knowledge-based organizations. They share new knowledge to develop long-term goals. They focus on skill enhancement, producing, acquiring, and sharing knowledge [7]. Therefore, organizational learning is a transformational process to update knowledge to develop skills and capabilities.

### 1-5. The conceptual framework of the research

The conceptual framework of this study was hypothesized based on theories and past investigations, as shown in Figure 2. This framework was tested and examined at IKCO and ISUZU companies in Iran by Gholamreza and Rahim (2016). The validity and reliability was confirmed via quantitative research using structural equation modeling. The maximum likelihood (ML) technique was used to fit the model by measuring fit indices. The factor loadings of SPSC at IKCO ranged from 0.677 to 0.960, and at Isuzu, from 0.714 to 1.06, which are very significant. This research is done in the automotive industry for the first time to evaluate strategic performance.

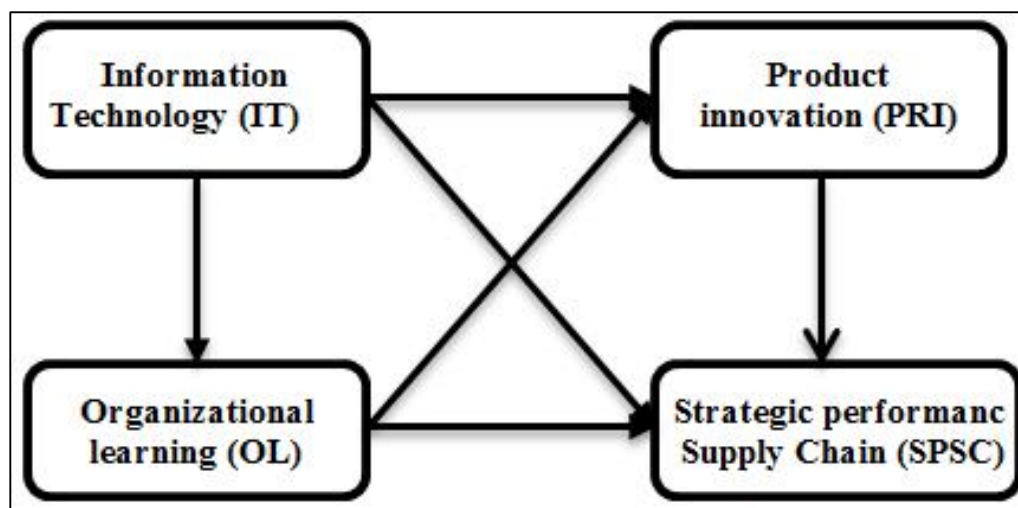


Fig. 2. Conceptual framework of the research adopted by Gholamreza and Abdul Rahman (2016)

Sanders and Premus presented an empirical research to show the direct effect of information technology on supply chain performance. In addition, they reported that organizations could attain operational benefits such as decreasing costs and cycle time of functions using IT across supply-chain management [13]. Management information system is one of the outcomes of IT including transaction processing system (TPS), decisions support system (DSS), and executive information system (EIS). Information flows down to up and up to down. TPS covers operational levels such as line production, warehouses, quality procedures, etc. DSS covers mid-level manager, and EIS covers the top manager. Strategic decisions are the outcomes of body information of organization, which are made at the executive level. Therefore, IT has positive effect on strategic performance [21].

New product development is one of the strategic

outcomes of organizations. Successful organizations involve key suppliers and vendors to develop new products [15]. Some pieces of the literature identify that new product development strategy should be focal activities in organizations [6]. Some studies have emphasized the factors involved in developing new product. Many investigations linked new product to strategic performance [19]. One of the most important themes of strategic performance is to measure firm performance in new product.

Whereas a time series of new product (e.g., the number of new products in a period) is one of the dimensions of strategic performance, Cooper and Kleinschmidt introduced some critical factors such as skills, organizational structures, relationships quality, and organizational learning to develop new product. Using IT tools helps to improve NPD outcomes [5]. IT is one of infrastructure tools to search, analyze, and keep

information and knowledge for creative and innovation on time. Changes in IT are occurring fast, thus the importance of development speed of products. Therefore, the speed of new product development has increased. In a survey, it is shown that more than 90% of senior managers believe that information technology enables innovation at all organizational layers [16]. Durmuşoğlu and Barczak examined and confirmed that use of decision support system as one of IT tools improves new product development. Song et al. surveyed the use of IT during NPD activities among relevant departments such as planning, engineering, and production facilities of new product development [17].

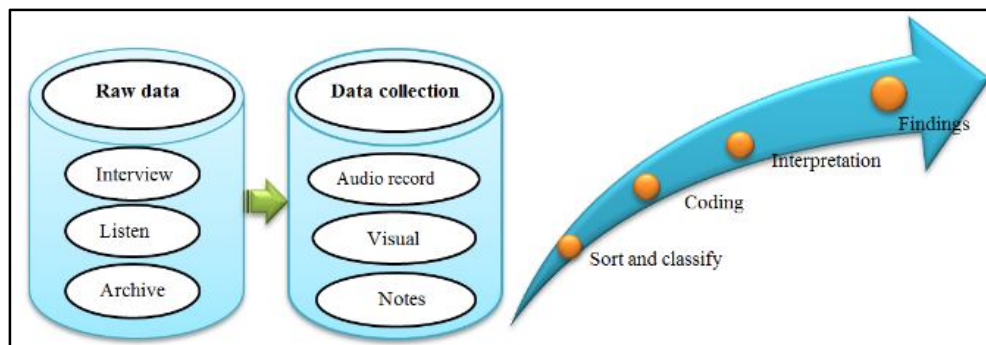
Processes and information transaction are supported by information technology through knowledge sharing and appropriate human capital [12]. An empirical research shows that there is a positive relationship between information technology and organizational learning. Information technology facilitates organizational learning through knowledge and information sharing [19]. Cooper and Kleinschmidt introduced some critical factors such as skills, organizational structures, relationship quality, and organizational learning to develop a new product. Organizational learning improves human capital to develop a new product [9].

## 2. Research Methodology

Research is a systematic process to collect and analyze data and information in order to understand the phenomenon, which we are interested to explore [16]. A research plan should include all materials and methods to conduct a study [17]. The structure of procedures and methods depends on the data type and research goals that researcher seeks to implement.

### 2-1. Research instrument development

Qualitative research was used to respond to research goals involving factors and their effect on strategic performance of supply chain. The case study is one of the important methods of academic researchers. Yin (2014) explained that case study as an empirical research analyzed an event, an individual, or an issue. The case study approach should be able to respond to the research questions that begin with why, what, and how [18]. As seen in Figure 3, qualitative method was utilized in order to obtain real information about phenomenon, people, systems, capabilities and to use appropriate sources of data such as interviews and archives. The process of data collection includes interview, notes, and voice record. The process of analysis includes sorting, coding, interpretation, and organizing findings.



**Fig. 3. Procedure for qualitative research**

According to the qualitative approach, a total number of 12 interviews was designed and done in order to collect data via a list of semi-structured questions [19]. Our respondents included experts, managers, and senior experts with strong experience in supply chain. As shown in Table 1, the minimum experience of participants is 8 years and the maximum of it is 32 years. Based on an interview plan, the sounds

of them were recorded in order to have integrated data for organizing data and information.

## 3. Results

Eight respondents had more than 10 years of experience, and two of them had less than ten years of experience in IKCO. One of suppliers as a respondent had more than 15 years of



experience in IKCO, and one was a dealer of IKCO to distribute and sell products; they were selected for interview. Both supplier and dealer had academic degree. The session of interviews was held in January and February 2017. The longest interview was done in 93 minutes with one who had 32 years of experience in IKCO. Moreover, the minimum time of the interview concerning training was around 35 minutes. Table 1 shows the details of respondents' background including code, experience, position,

education level, field of career, and field of study.

In the first step, based on a scheduled program and arranging with participants for interview at a specified date and time, all interviews were recorded. All questions were based on semi-structured interview and research questions. At first, the field of study, topic, and models were explained in detail to what the researcher wants to do. After recording interviews, the spoken data were transcribed.

**Tab. 1. The respondents' background of IKCO**

Row	Respondent's Code	Experience (year)	Position	Education Level	Field of career	Field of study
1	HOES	32	Consultant	Master	Logistics	Mechanical Eng.
2	ALFL	10	Head of Department	Master	Strategic Department	MBA
3	ALKH	22	Head of Training	PhD student	Training and Development	Industrial Eng.
4	MARA	14	Head of Sales Department	Master	Sales Department	MBA
5	ALPA	15	Expert	Master	Logistics	Industrial Eng.
6	MOYA	12	Expert	Master	Affair of Contracts and Manufacturing	Industrial Eng.
7	MAZO	8	Expert	Master	Packaging	Industrial Eng.
8	MOMO	15	Manager	Master	Export	Industrial Eng.
9	ALNA	8	Expert	Bachelor	Planning and Logistics	Industrial Eng.
10	HOMU	25	Expert	PhD student	Quality Assurance	Management
11	ALKA	20	Supplier	Master	Supplier	Industrial Eng.
12	RASA	28	Dealer	Bachelor	Dealer	Physics

All dimensions of variables were coded according to Table 2, which were used in qualitative analysis. These dimensions are explored via literature review and past investigations. In fact, these dimensions evaluate relevant variables of the model. SPSC construct

includes vision, mission, long-term goals, competitors' analysis, and on-time strategic decision for NPD. OL consists of sharing new knowledge, critical capability, skills, and organizational improvement. The other scales of the constructs are mentioned in the following table.

**Tab. 2. Coding system of the dimensions**

Variables	Dimensions	Dimensions' Code
Strategic Performance of Supply Chain (SPSC)	Vision, Mission	SP1
	Long-Term goals	SP2
	Competitors analysis	SP3
	On time strategic decisions for NPD	SP4
Organizational Learning (OL)	Sharing new knowledge	OL1
	Critical capability and skills	OL2
	Organizational improvement	OL3
Product Innovation (PRI)	Novel of new product	PRI1
	Time series of new product	PRI2
	Suppliers' collaboration for NPD	PIR3
Information Technology (IT)	Direct relation as computer-to-computer with suppliers	IT1
	Electronic transaction for demand, order, invoice	IT2

**3-1. Developed situation of SPSC model in IKCO**

The respondents' opinions are summarized in Tables 3, which are classified into low-, medium-,

and high-developed levels to evaluate constructs in IKCO. In fact, this table shows how much these dimensions have been developed.

**Tab. 3. The Summary of Status of SPSC Model at IKCO**

Row	interviewee's Code	IT		OL			PRI			SPSC			
		IT1	IT2	OL1	OL2	OL3	PRI1	PRI2	PRI3	SP1	SP2	SP3	SP4
1	HOES	A	A	B	A	B	B	B	A	A	B	A	B
2	ALFL	A	A	A	A	A	B	B	B	B	A	B	B
3	ALKH	A	A	B	B	A	A	A	A	A	A	A	A
4	MARA	B	A	A	A	B	B	A	B	A	B	B	A
5	ALPA	A	A	B	B	A	B	B	B	B	A	A	B
6	MOVA	B	A	A	A	A	B	A	A	A	B	B	A
7	MAZO	A	A	B	B	B	A	B	A	A	A	B	B
8	MOMO	A	A	A	B	B	B	B	A	B	A	A	B
9	ALNA	A	A	A	A	B	B	B	A	A	B	B	B
10	RAMO	B	B	B	B	A	B	A	B	A	B	B	A
11	ALKA	A	A	B	A	B	B	B	A	B	B	---	B
12	RASA	A	A	A	A	A	B	B	---	--	--	A	B

A: High development    B: Medium development    C: Low development

**3-2. The evaluation of the dimensions of SPSC model at IKCO**

According to the conceptual framework and main dependent variable (SPSC), PRI and OL as the second and third dependent variables, respectively, were explored. According to Table 4 and Figure 4, based on the interviewees' idea, strategic performance of the supply chain (SPSC) has been developed at the medium level around

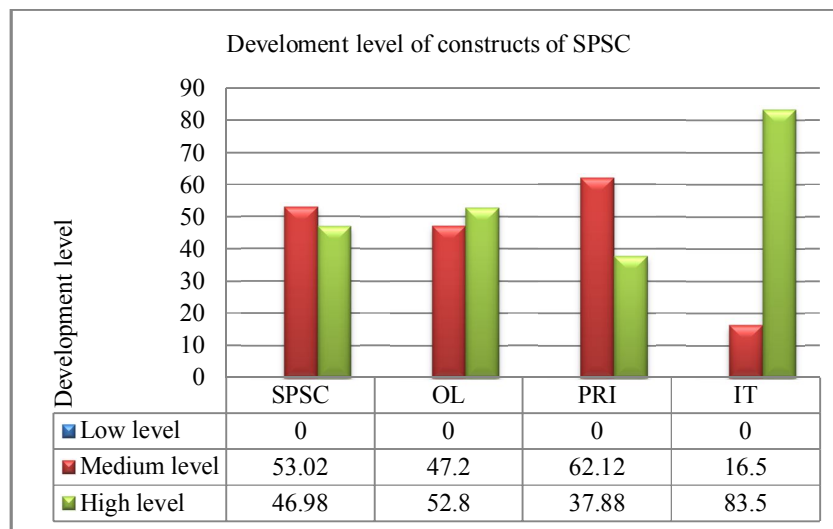
57.58 percent and 42.42 percent at the high level.

Organizational learning (OL) has been developed at the medium level around 47.2 and at the high level around 52.8, implying the appropriateness of development. Product innovation (PRI) has been developed around 56.52 percent at the medium level and 43.48 percent at the high level. Information technology (IT) has been developed 16.67 percent at the medium level and 83.33 percent at the high level. These statistics show that IT has the most development at the high level among other factors, and SPSC has the least

development at the high level.

**Tab. 4. Descriptive statistic for developed level of SPSC Model’s dimensions in IKCO**

Variables	Dimensions' Code	Developed level					
		Low		Medium		High	
		Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
SPSC	SP1	0	0	4	36.4	7	63.6
	SP2	0	0	6	54.5	5	45.5
	SP3	0	0	6	54.5	5	45.5
	SP4	0	0	8	66.67	4	33.33
	Mean	0	0	6	53.02	5.25	46.98
OL	OL1	0	0	6	50	6	50
	OL2	0	0	5	41.67	7	58.33
	OL3	0	0	6	50	6	50
	Mean	0	0	5.67	47.2	6.33	52.8
PRI	PRI1	0	0	10	83.33	2	16.67
	PRI2	0	0	8	66.67	4	33.33
	PIR3	0	0	4	36.36	7	63.64
	Mean	0	0	7.33	62.12	4.33	37.88
IT	IT1	0	0	3	25	9	75
	IT2	0	0	1	8	11	92
	Mean	0	0	2	16.5	10	83.5



**Fig. 4. The developed level of constructs of SPSC model in IKCO**

**3-3. Organizational learning (OL)**

Organizational learning was explored as the last dependent variable in the SPSC model by path analysis (SPSS) [8]. Based on Table 4, approximately, all participants confirmed that there is an appropriate situation in the field of organizational learning to develop knowledge and learning. They said that they possessed share point software to share knowledge and scientific information among members of the supply chain. Even suppliers have username and password to enter share point. They can download PDF files to use. A respondent MOMO stated that:

*“IKCO has prepared appropriate IT tools such as SAP, Share point, and KANBAN since ten years ago. IT as one of the infrastructure tools is used to share new knowledge and develop learning. By comparing the previous conditions and current status, it can be concluded that IT has affected positively organizational learning.”*

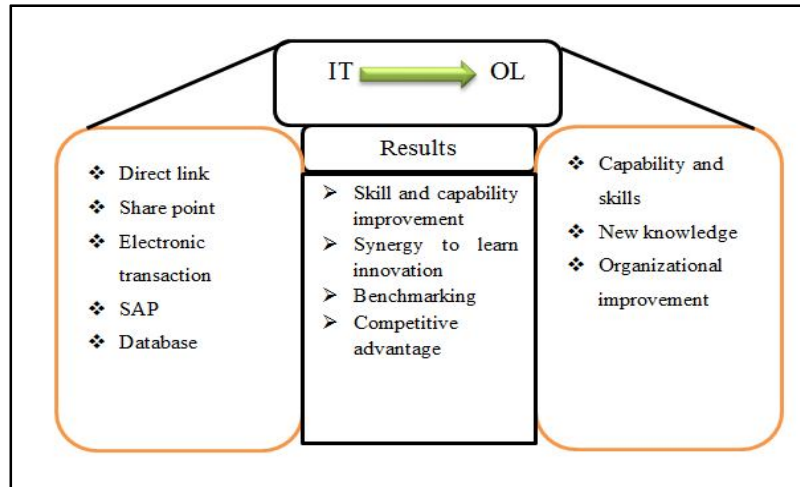
Some respondents pointed out the process and procedures, and instruments were established to improve organizational learning. A respondent ALNA pointed out that:

*“There are processes and procedures to increase*



skills. For example, each employee wanting to be promoted must pass some courses based on scheduled program of Training Center. All

experts have the career job to promote. Therefore, there are enough motivations to learn.



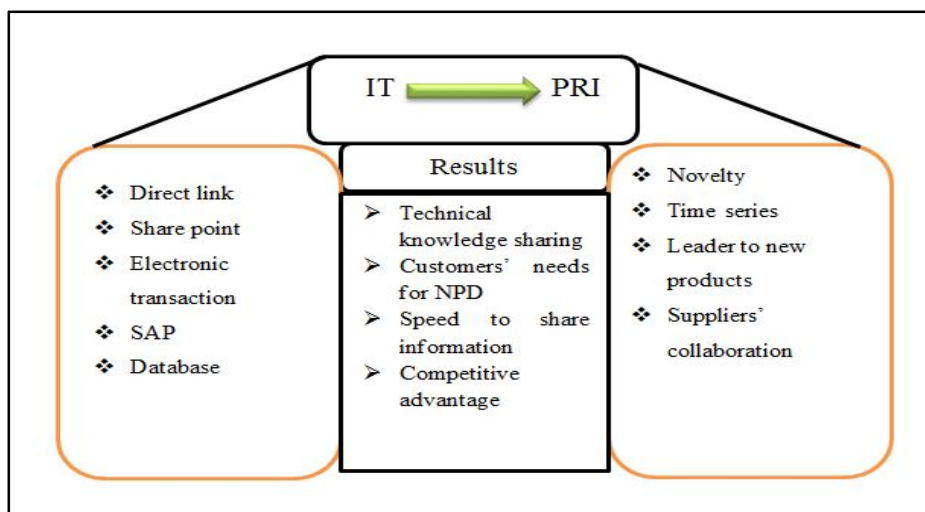
**Fig. 5. The effect of IT on OL adopted by respondents**

The majority of respondents stated that direct link and electronic transaction between IKCO and suppliers has had many outcomes to share new knowledge and information. As shown in Figure 5, skills and capability improvement have been derived from the interaction between IT and organizational learning. Synergy is one of the significant outcomes of this interaction to learn among all actors of SCM for organizational improvement and innovation.

**3-4. Product innovation (PRI)**

Product innovation (PRI) was explored as the second dependent variable in path analysis technique [8]. According to Table 4,

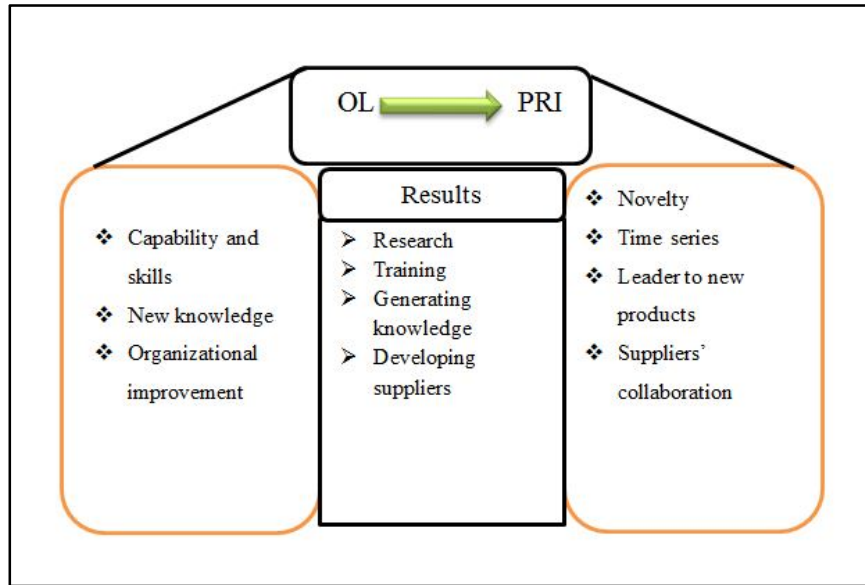
approximately, all respondents confirmed the medium level of new product development in world class. A respondent MOMO stated that: *“In my opinion, IKCO should try to establish a world class standard to develop new products. Still, there is a lot of gap in the market for new products with appropriate price. Based on the aspects of time to market and the number of new products in different time series, IKCO has been located at the medium level in the world class. IT and OL have a basic role in developing learning and skills for improvement of new product. In fact, I think OL and IT have affected positively NPD”*



**Fig. 6. The effect of IT on NPD adopted by respondents**

Most of the participants pointed out that direct link and electronic transaction have helped to improve research processes to develop new products. As Figure 6 shows, IT helps to collect customers' needs and share technical knowledge to improve and promote products, options, and develop new products. One of the most important

goals of automakers is to provide additional new products in various time durations. There are some resources including internet, online databases, local and foreign suppliers, and customers that require to be studied in the field of new products and situation of competitors.



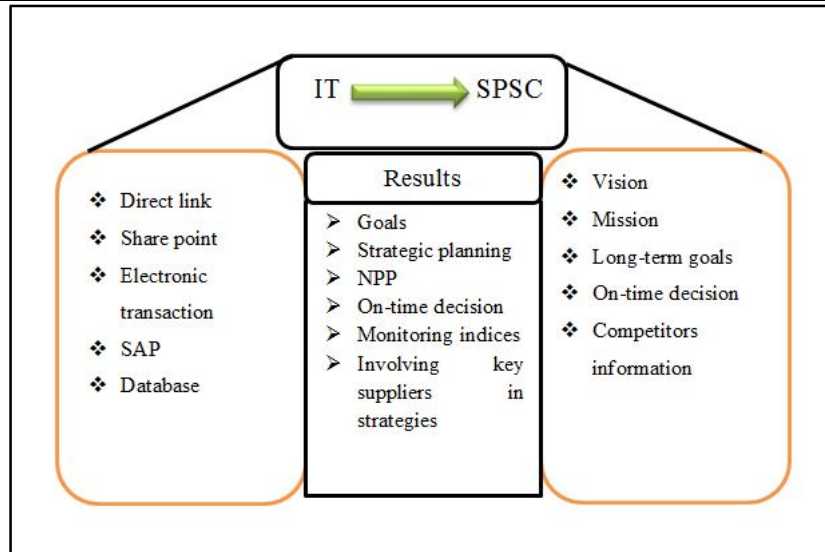
**Fig. 7. The effect of OL on PRI adopted by respondents**

As shown in Figure 7, the majority of respondents pointed out that manufacturing firms need to improve employees' skills, especially in technical and engineering departments. The skill improvement is done by training to develop new products, options, and capabilities of the current products. The training center of IKCO has a training calendar to promote suppliers. Now, IKCO has contract with suppliers of grades A and B. The key suppliers have interacted to develop new products. In fact, IKCO has involved key suppliers for long-term goals. Automakers need skilled experts to research in the field of new product development and generate technical knowledge for innovation.

**3-5. Strategic performance of supply chain**

Strategic performance of the supply chain was explored as the main dependent variable in the SPSC model by path analysis technique [8]. As shown in Table 3, approximately, most of the respondents emphasized that there are appropriate situation in the domain of strategic performance of supply chain in IKCO. A respondent MOM stated that:

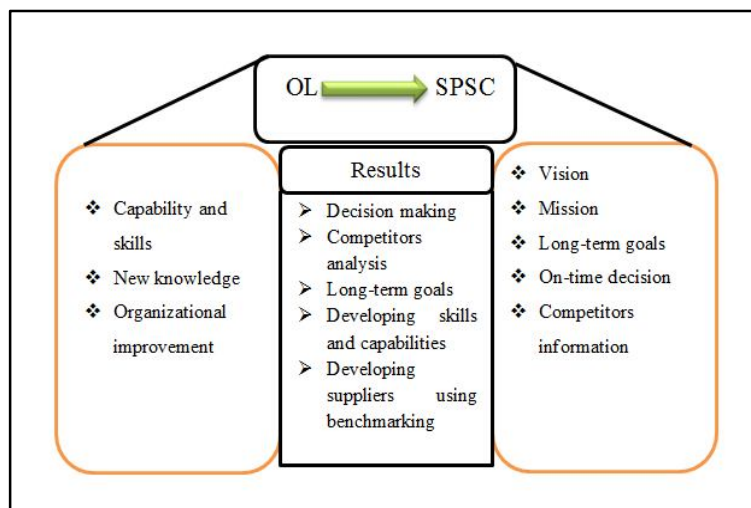
*“The vision and long-term goals are documented and published every year in IKCO. The novelty of new products lies at the medium level in world class. I think IKCO should go toward agile structure, on-time decision-making to develop new products. IT, OL, and PRI have improved strategic performance of the supply chain.”*



**Fig. 8. The effect of IT adopted by respondents**

Approximately, all participants emphasized that, nowadays, IT is one of the most important infrastructures to make on-time decisions and collect competitors’ information. TPS, DSS, MIS, EIS, and ERP have made appropriate condition to flow information across SCM to prepare action

plans and long-term goals. Based on Figure 8, monitoring indices, on-time decision-making, and new-product development are other outcomes of IT tools. The managerial dashboard shows the key performance indices and distance to targets.



**Fig. 9. The effect of OL on SPSC adopted by respondents**

According to Figure 9, most of the participants emphasized that organizational learning has the positive effect on strategic performance of the supply chain. Organizational learning helps to

achieve an appropriate condition to develop decision-making accurately, long-term goals, competitor analysis, and vision through acquiring skills.

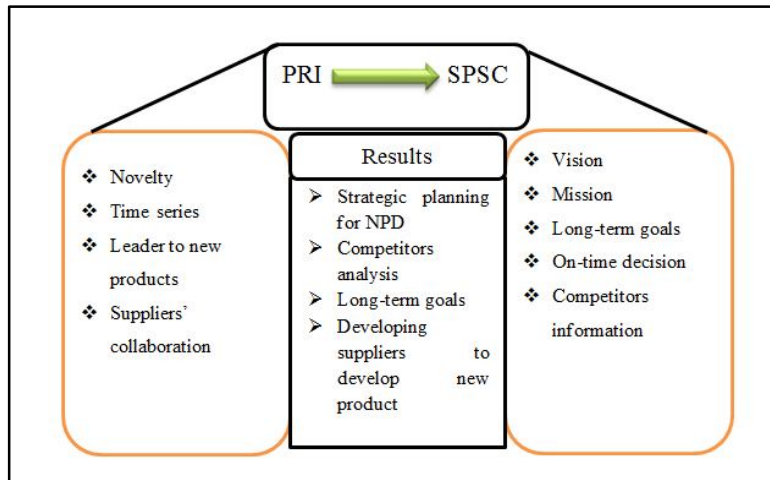


Fig. 10. The effect of PRI on SPSC adopted by respondents

Based on Figure 10, the majority of respondents stated that one of the long-term goals is to develop new products in various time durations. The basis of new product development is to analyze competitors' information about their products and gap market. They stated that IKCO should go towards agile structure to make on-time decisions for NPD. Therefore, in the environment of rapid changes, market needs should be identified on time to develop new products.

According to this qualitative research, five hypotheses developed are as follows:

**H1.** Information technology has positive effect on Strategic performance of supply chain.

**H2.** Information technology has positive effect on product innovation.

**H3.** Information technology has positive effect on organizational learning.

**H4.** Organizational learning has positive effect on strategic performance of supply chain.

**H5.** Organizational learning has positive effect on product innovation.

**H6.** Product innovation has positive effect on strategic performance of supply chain.

#### 4. Discussion

According to the research of Gholamreza and Abdul Rahman (2016), SPSC model was predicted by OL, PRI, and IT. They examined the SPSC model using structural equation modeling by Amos. In this research, SPSC model was developed by OL, PRI, and IT based on respondents' opinions and technical documents in IKCO. Based on the qualitative research, answers and ideas were classified into three

categories "A: high-development level, B: medium-development level, and C: low-development level" in order to evaluate constructs in IKCO. As shown in Figure 4, IT has been developed in IKCO more than another constructs at the high level. Of course, it is needed to develop SAP across SCM in order to integrate all members and increase strategic performance of supply chain. Vision and goals should be linked to key suppliers and vendors' goals using SAP. IKCO can trace all production, shipment from Peugeot France in terms of quantity, invoice number, date, etc. All participants of this research stated that IT as infrastructure tool effectively helps to develop SPSC. Product innovation has been developed around 43.48 percent in IKCO at the high level, which should involve key suppliers to develop new products. There are many benefits to involve suppliers; firstly, the risks of NPD are shared between IKCO and suppliers; secondly, IKCO can use capabilities and abilities of key suppliers in order to avoid extra investments and keep financial resources. All respondents pointed out that NPD is one of the SPSC's dimensions and has positive effect on strategic performance of supply chain. In addition, in a study, it was confirmed that organizational learning affected SPSC [8].

IKCO should try to develop OL across SCM in order to improve SPSC. Strategic performance of supply chain has been developed around 42.42 percent in IKCO at the high-development level, which need to be developed in the field of NPD and to publish long-term goals across SCM who are involved in NPD and relevant common issues. Skills and capability improvement and synergy to learn innovation are the results of the interaction between IT and OL. In fact, IT facilitates

developing knowledge toward organizational learning. Information flow across SCM is the most important outcome of IT in order to share knowledge and information. Whereas data and information are the bases of decision-making in organizations, IT has a basic role in this purpose. Technical knowledge sharing, customers' needs for NPD, and speeding up to share information

are the outcomes of the interaction between IT and PRI.

IKCO should establish an infrastructure to communicate and establish long relationships. Therefore, IKCO and suppliers should have a deep understanding of each other's needs. They can develop strategies and long-term goals in direction common plans.

**Tab. 5. Strategies and Plans Matrix between IKCO and suppliers**

IKCO strategies \ Supplier strategies	Stable Profitability	Suppliers development	Vendors development	Market share increment	New product development	IT development	Organizational Learning development
Stable Profitability	✓	✓		✓	✓	✓	
Market share increment	✓	✓		✓	✓	✓	
5S review		✓			✓		✓
Developing production equipment	✓	✓		✓	✓	✓	✓
New product development	✓	✓		✓	✓	✓	✓
Reduction of production costs	✓	✓		✓		✓	✓
Improvement of TPM	✓	✓		✓	✓	✓	✓
Skill development by job rotation matrix	✓	✓		✓	✓	✓	✓
IT development		✓		✓	✓	✓	✓
Organizational Learning development		✓			✓	✓	✓

Table 5 shows a sample of the strategy matrix between IKCO and suppliers. This matrix shows that common plans and strategies can help them to attain stable profitability, more market share, and develop IT like ERP to have an effective communication infrastructure. Organizational learning as a common strategy helps develop new products and knowledge. Common strategies are developed and implemented by common cross-functional teams effectively.

Figure 11 shows the implementation process of SPSC across SCM as follows:

1. Create strategic team (planning, R&D, quality assurance, sales and after sales services managers and top manager, and key suppliers' member)
2. Prepare instruction to implement strategic planning (ISP) in every three months based on the steps below:
  - a) Publish documented vision and mission.
  - b) Competitors' analysis includes new products, methods to sell, technology, quality level of

products, pricing, and weakness and strengths of similar products.

- c) Use PESTLE model including political, economic, social, technological, legal, and environmental aspects to identify opportunities and threats.
- d) Identify weaknesses and strengths (WS).
- e) Analyze SWOT matrix or other strategic tools to identify strategies, which will be done based on timelines of short-term, mid-term, and long-term.
- f) Meet focal firms' strategies to key suppliers' strategies in order to introduce new products and achieve high performance in quality, delivery, and production costs. Prepare a matrix to meet focal firm and use key suppliers' strategies to define common strategies, as shown in Table 5.
- g) Measure common strategies progress in every three months and put it on monitoring system as a strategic performance to inform relevant suppliers



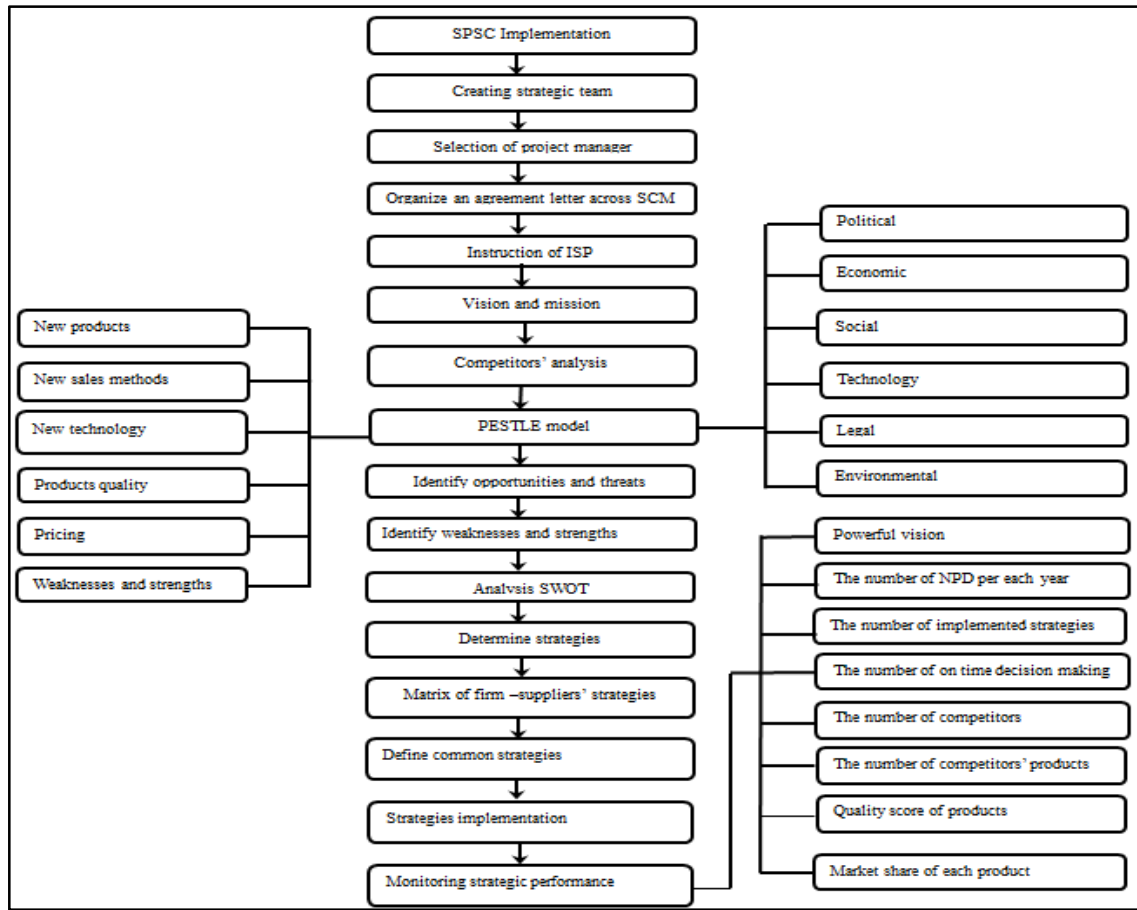


Fig. 11. Flowchart of SPSC implementation

Tab. 6. Dimensions of constructs and the results of impacts

Constructs	Dimensions	Impacts	Results
IT	<ul style="list-style-type: none"> <li>❖ Direct relation as computer-to-computer with suppliers</li> <li>❖ Electronic transaction for demand, order, invoice</li> </ul>	IT → OL	<ul style="list-style-type: none"> <li>❖ Skills and capability improvement</li> <li>❖ Synergy to learn innovation</li> </ul>
		IT → PRI	<ul style="list-style-type: none"> <li>❖ Technical knowledge sharing</li> <li>❖ Customers' needs for NPD</li> <li>❖ Speeding up to share information</li> </ul>
OL	<ul style="list-style-type: none"> <li>❖ Sharing new knowledge</li> <li>❖ Critical capability and skills</li> <li>❖ Organizational improvement</li> </ul>	OL → PRI	<ul style="list-style-type: none"> <li>❖ Research</li> <li>❖ Training</li> <li>❖ Generating knowledge</li> <li>❖ Promoting suppliers</li> </ul>
PRI	<ul style="list-style-type: none"> <li>❖ Novel of new product</li> <li>❖ Time series of new product</li> <li>❖ Suppliers' collaboration for NPD</li> </ul>	IT → SPSC	<ul style="list-style-type: none"> <li>❖ NPD</li> <li>❖ On-time decision</li> <li>❖ Monitoring indices</li> </ul>
SPSC	<ul style="list-style-type: none"> <li>❖ Vision, Mission</li> <li>❖ Long-Term goals</li> <li>❖ Competitors analysis</li> <li>❖ On time strategic decisions for NPD</li> </ul>	OL → SPSC	<ul style="list-style-type: none"> <li>❖ Decision making</li> <li>❖ Competitors' analysis</li> <li>❖ Long-term goals</li> </ul>
		PRI → SPSC	<ul style="list-style-type: none"> <li>❖ NPD</li> <li>❖ Decision making to develop new product</li> <li>❖ Competitors' analysis</li> </ul>

Table 6 shows the effect results of constructs on each other. Studying, training, generating knowledge, and promoting suppliers are the outcomes of the effect of OL on PRI. All the

mentioned results improve to develop new product by involving key suppliers in the field of new projects. New product development, on-time decision, and monitoring indices are the results



of the effect of IT on SPSC. In fact, NPD is the most important result of the interaction between IT and SPSC. Decision-making, competitors' analysis, and long-term goals are the results of the impacts of OL on SPSC.

### 5. Conclusion

The schematic of IKCO supply chain is shown in Fig. 1 that illustrates upstream, midstream, and downstream of SCM including suppliers, main firm, vendors, and after sales service. According to Figures 2 and 3, the evaluation of SPSC model using qualitative research was concluded in order to provide a new model to develop strategic performance of supply chain, information technology, organizational learning, and product innovation. Confirmation of all hypotheses was done by understanding, perceiving, and exploring phenomena and events in IKCO. According to our practical contribution, IT as an infrastructure instrument connects all chains to develop OL, PRI, and SPSC.

Organizational learning improves the situation of PRI and SPSC. Product innovation as one of SPSC's dimensions affects strategic performance of supply chain. Twelve interviews were done to understand the developing situation of constructs in IKCO and examine the model. Based on Table 1, codes are assigned to all dimensions. Table 2 shows the developed situation of constructs according to respondents' ideas. Figure 4 shows the developed level of constructs, most of which are related to IT at high level equal to 83.5 percent and at least equal to 37.88 percent relating to new product development. The developed situation of constructs is shown in Figures 5 to 10 as details and more comments of respondents. Common strategies between IKCO and suppliers help them to achieve goals as seen in Table 5. Therefore, SPSC model can be implemented according to a flowchart, as shown in Figure 11. To sum up, the convergence of IT, OL, and PRI led to the development of SPSC across SCM by common CFT. Common goals lead to the development of organizational behavior and culture. These effective communications improve performance indexes across SCM.

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