The Impact of Ownership Status and Regional Differences on SCM Operational Performance in China

Jingjing Gong 1 and Sadami Suzuki 1

1 Department of Industrial Engineering and Management, Tokyo Institute of Technology, Tokyo, Japan

Abstract: Despite the remarkable recent economic growth, so many problems are still piling up in the domain of logistics and supply chain management (SCM) in China. Moreover, economic discrepancy and regional differences have been increasingly expanded and it could be considered that such disparities might constrict further development of Chinese economy. Thus, this research is intended not only to investigate the SCM operational performance of Chinese enterprises in different firm size, different ownership status and different regions by utilizing the data of SCM logistics scorecard (LSC) but also identify and solve the problems in order to improve the efficiency and global competitiveness of Chinese SCM in a further step.

Key Words: Supply chain management, Economic discrepancy, Regional difference, SCM logistics scorecard (LSC)

1. Introduction

With the development of global competition and information technology in the 21st century, individual business finds it is hard to win competition as a solely independent entity, but rather as a supply chain. In order to respond to the diversification of consumer needs and shorten the product life cycle, individual companies should cooperate with their partners together to establish an efficient supply chain for improving business competitive capacity. As a result, supply chain management (SCM) has become a key role in building sustainable competitiveness for their products in a highly competitive market [1].

As a fast newly industrialized developing country, China is playing a more and more important role in the global economy. However, compared with developed countries, the level of SCM in China has been lagging behind for many years [2]. China’s low labor cost has made China become the world’s “Manufacturing Factory”, and won the competitive advantage for a while. However, the low labor cost cannot substitute for efficient SCM and it also cannot establish successful SCM. Under the economic globalization context, the historical competitive advantage of low labor force and raw material costs are fading away with the progress of economic development, Chinese enterprises must improve the level of SCM to maintain their sustainable and stable development.

However, numerous factors are considered to affect supply chain management. Cultural difference, ownership status, regional economic disparity and firm size could either improve or impede the ability of supply chain partners, which are resulted directly in the entire supply chain’s operational performance [3]–[5]. In particular, the Chinese regional economy growth is lopsided that means the SCM operational performance in China is influenced by inter-provincial and inter-ministerial relationships [7]. Meanwhile, the Chinese traditional culture could affect significantly on the Chinese SCM operational performance [8].

The first objective of this research mainly focuses on measuring the supply chain operational performance in different firm size companies in China. Previous researches indicate that different firm size may have a significant influence on SCM, and larger firms apply more formal management techniques on inventory management and modeling as well as more sophisticated information systems to deal with the increased complex environment [8], which could bring about different level of SCM performance in different firm size companies.

Despite the increased attention paid to SCM performance measurement, there haven’t much literatures to compare supply chain operational performance among different ownership companies in China. The earlier research focused on comparing state ownership enterprises (SOEs), foreign ownership enterprises (FOEs), and private and individual enterprises (POEs) in other performance areas such as management model [9], innovation performance [10], human resources management performance [11], capital productivity [12], and enterprise technology management [13].

The purpose of this article is to provide empirical, comparative data and analysis of SOEs, FOEs and POEs in China whether they perform significantly different in the area of supply chain operational performance. In addition, economic development is unbalanced among China’s eastern, central and western regions [14]. This kind of regional economic disparity impacts China’s overall economic growth and it also influences the building of SCM in China.

According to the existing SCM performance measurement tools, most of them are Likert scale based on questionnaire. Although the SCM Logistics Scorecard (LSC) has been developed also based on the concept of 5-point Likert scale, the definition on level 1-5 of each assessment item is clearly defined in its own
way. Additionally the LSC has been found to be efficient to analyze the relationship between supply chain performance and its managerial performance [15], the connection between logistics performance and financial outcome [16]. Moreover, the LSC has been also implemented in identifying factors which determine the operational performance of SCM and their impacts on financial indices [17]. Therefore, this scorecard could be considered as a data collection tool for this research.

The rest of this paper is organized in the following order. The research hypotheses are clearly stated in section two and the methodology including the LSC is explained in the subsequent section together with the data collection process in China. Data Analysis and results which include comparative analysis in different firm sizes, ownership status, and regions, factor analysis in China’s SCM performance structure, and comparison on factor scores are outlined in section four. The conclusions are given in the final section of this paper.

2. Literature Review

Supply chain management in China is under developing. There are lots of factors which influence China’s SCM building. Surveys on SCM of Chinese firms have been conducting for many years. However, along with progress in academics and practices, the questionnaires used in the former surveys cannot fulfill the requirements for the systematical SCM evaluation of the contemporary Chinese firms [18].

Supply chain performance measurement is earlier noted as a significant foundation for improving the efficiency of the entire supply chain. Performance measures could be used not only for driving continuous improvement of business but also setting directions for future strategies in the organization. Meanwhile, suitable and accurate performance measurement is considered beneficial to the improvement of SCM. A scorecard is a simplified benchmark methodology to diagnose and evaluate various advantages and disadvantages of their business operations from the point of total optimization of SCM.

It is well known that larger firms have advantages of greater financial resources and economies of scale in favor of outsourcing [19], and larger organizations are also expected to possess the financial resources and risk capacity necessary for new technology investments and will be associated with greater levels of supply chain technology [20], while, lack of technical knowledge and resources inhibit technology adoption in small firms [21]. Therefore, the Hypothesize 1 is derived as that:

H1: Supply chain operational performance is different among firm size.

Ownership status is considered to be had a significant impact on logistics outsourcing, and foreign owned firms are more likely to use logistics outsourcing [22]. Ownership status influences SCM structure, and the influencing factors which establish supply chain operational performance of multinational and local companies are different in Thailand [23]. Thus, the Hypothesize 2 in this research is:

H2: Supply chain operational performance is different among ownership status.

Regional disparity impacts the economic growth and labor market [24], and it can also affect the construction of logistics and IT infrastructure in China [25], consequently, the Hypothesize 3 is proposed:

H3: Supply chain operational performance is influenced by regional disparity.

Since, the ownership status and regional disparity make a difference to logistics and technology development, thus, the Hypothesize 4 is developed:

H4: The interaction between ownership status and regional disparity has a significant influence on supply chain operational performance.

3. Methodology

This section describes questionnaire development, measurement, data collection and analysis method.

3.1 Questionnaire

The data collection tool for this research is the SCM Logistics scorecard (LSC), which has been developed since 2001 by Tokyo Institute of Technology (Tokyo Tech) in collaboration with Japan Institute of Logistics system (JILS). The scorecard was built after conducting surveys on various well-known SCM scorecards, such as Efficient Consumer Response (ECR), Standard ECR, Quick Response (QR), SCOR model and so on. These existing scorecards are investigated through those measurement items.

The Hayashi’s Quantification Method (Type III) classification was subsequently conducted to configure the position of each scorecard between two dimensions: the performance-driver orientation and the managerial-technical orientation. As a result, none of the existing scorecards was considered to be balanced between these two dimensions. For this reason, the ultimate goal of LSC is to have a balance of these two dimensions together with a simple and versatile concept in order to get an easy database building process for benchmarking purposes.

3.2 Measurement

SCM Logistics scorecard (LSC) encompasses 22 assessment items based on four fundamental areas, namely: (1) Corporate Strategy and Inter-Organization Alignment, (2) Planning and Execution Capability, (3) Logistics Performance and, (4) IT Methods and Implementation. Each assessment item is allocated into 5-point scale from one to five. The detailed description of each level is also given indicating the 5th level as the best practice for each item.

This method is different from the normal Likert-scale questionnaire, which, for example, gives statements and asks participants to judge themselves as strongly disagree (Level 1) to strongly agree (Level 5). With clearly provided information on each level, not only the respondents could identify themselves more precisely but also the bias among them could be reduced.

The score of one integer and a half (for example 2.5) is also acceptable for managers who place their companies between two levels. Based on the generality of this scorecard, individual companies could not only perform their self-assessment, but also could compare their performance with competitors in the same industry cluster as well as across sectors. The result of this assessment could indicate the strengths and weaknesses of
the existing working method from SCM perspective [26]. The detail of LSC is presented in the Appendix.

3.3 Data Collection Process

The LSC data collection has been carried out initially in Japan and then extended to China, Thailand, Finland and South Korea in order to expand the scope of LSC research to international comparisons. Accordingly, the LSC has been translated into other languages including English, Chinese, Thai, Finnish and Korean from its original version in Japanese.

The data collection process in China was launched from 2006 in cooperation with Tsinghua University, Xi’an Jiaotong University and Shanghai Jiaotong University. The data were obtained by means of face-to-face interviewing, telephone interviewing and sending emails to high-level managers. At the time of writing, 236 valid data are successfully obtained from Chinese companies, which are located across 17 provinces and cities in China.

According to the different ownership structure, those achieved data can be classified into three ownership status types: state owned enterprises (SOEs), foreign owned enterprises (FOEs) and private and individual owned enterprises (POEs). Referring to the different annual turnovers, those obtained data can be divided into four firm sizes: small, middle, large and mega firms.

Meanwhile, in accordance with the different GDP per capita in those provinces and cities, these collected data can be separated into two different regions: top 3 of GDP per capita regions and the others. The category of LSC data from China is shown in Table 1.

![Histogram of LSC total score for Chinese participant companies](image)

**Table 1** Category of participant companies

| Category       | Number of company |
|----------------|-------------------|
|                | Ownership Status  | Total |
|                | SOEs | FOEs | POEs | Unknown |         |
| Small Firms    | 6    | 9    | 21   | 2       | 38      |
| Middle Firms   | 23   | 41   | 45   | 4       | 113     |
| Large Firms    | 10   | 21   | 6    | 0       | 37      |
| Mega Firms     | 9    | 24   | 5    | 0       | 38      |
| Unknown        | 2    | 3    | 1    | 4       | 10      |
| **Total**      | 50   | 98   | 78   | 40      | 236     |

3.4 Reliability and Data Attribute

As a result of the data collection, the histogram of the LSC total score (120) for 236 Chinese participant enterprises, including the average score in four areas of assessment are displayed in Figure 1 and Table 2 so as to present the overview of Chinese SCM performance.

In order to ensure the reliability of LSC data which was used in this research, the Cronbach’s coefficient alpha was calculated during the data collection process.

The result is shown in terms of Cronbach’s coefficient alpha at 0.957 for 22 assessment items from Chinese data. This result indicates that high reliability of LSC is ensured. As the data attribute reveals, the average total score is shown as a bimodal distribution. This polarization of Chinese data distribution may be caused by regional and cultural disparity.

The summarized data of Japan and China from previous work is briefly presented in Figure 2 and Table 2 to outline the primary comparison result between these two countries. T-test is respectively conducted on average total score with each average area score to identify whether these scores are influenced by country difference.

The outcome of t-test is also presented in Table 2. Findings from t-test demonstrate that t-values of total score and all average area scores, except for area 4, are less than 0.05, confirming that these scores are statistically different. As the result shows, Chinese companies occupied higher scores than Japanese ones, especially in area (1) Corporate Strategy and Inter-Organization Alignment, taking up the biggest difference which was noticeable at a fairly high significant level. On the other hand, the area (4) IT Methods and Implementation was dominated by the Japanese companies but not at significant level.

![Average scores of four areas between Japanese and Chinese companies](image)

The primary comparison only offers general idea when evaluating Chinese performance score against other countries. Therefore, the Chinese data should be further utilized to investigate. For example, firm sizes, ownership status and regional disparity should be taken into considerations in terms of Chinese data classification. It may possibly imply the supply chain operational performance and characteristics of genuine Chinese industry.
4. Data Analysis and Results

4.1 Raw Score Comparison

4.1.1 Comparative analysis on different firm sizes

The purpose of this section is to demonstrate whether the SCM operational performance is significantly different among different firm size companies. The method of One-way Analysis of Variance (One-way ANOVA) is used in this section.

From the viewpoint of turnover, the 236 respondents can be divided into four groups, as small firms, middle firms, large firms, and the mega firms. According to the “The division standard of Large, Middle and Small Enterprises” of China, the annual turnovers (in million RMB) for the small, middle, large and mega firms are [0, 50), [50, 500), [500, 5000), [5000, ∞), respectively. Figure 3 shows the frequency distribution of the 236 firms with different annual turnovers.

![Fig. 3 Number of Participant companies with different firm size](image)

The average total score and average area score from different firm size companies are summarized and revealed in Table 3 and Figure 4 in terms of bar chart.

As the result shows, large and mega companies take the higher average total score and areas scores than small and middle companies. Especially, in the area (4) IT Methods and Implementation has a big difference among each firm size companies than other areas.

This result is consistent with the conclusion of Rogers [27], Patterson [28] and Ellinger [29] that networks, website and other supply chain technologies are influenced by the firm size. Large companies may have more information to manage, and thus would be more likely to adopt information technology systems to improve operational efficiency. Results from ANOVA analysis indicate that, supply chain operational performance in terms of LSC scores has been influenced by firm size and then the Hypothesis 1 is supported.

4.1.2 Comparative analysis on different ownership status

The purpose of this section is to test that supply chain operational performance is different among ownership status. The method of One-way Analysis of Variance (One-way ANOVA) is also used in this section among different ownership companies.

The Chinese companies could be mainly divided into three groups, namely: state owned enterprises (SOEs), foreign owned enterprises (FOEs) and private and individual owned enterprises (POEs). Although the category of Chinese data could be classified into more than three categories, only three groups are included in this study.

It has been regarded that these three ownership companies have contributed to form the economic growth of China over the last 20 years [30]. Average total LSC score including fore area score of surveyed enterprises are compared and revealed in Figure 5 and Table 4 in terms of distribution chart. The result of ANOVA analysis is also shown in Table 4.

![Fig. 5 Distribution of total score among different ownership companies](image)

As initial results in the Figure 5 reveal that, FOEs occupies...
the higher average total score and area scores than SOEs and POEs. This comparison within China shows that, the FOEs group performs better than the SOEs and POEs in all areas, also the SOEs outperforms the POEs in all areas. This result is consistent with the conclusion of Sun [31].

However, the ownership status don’t have a significant difference on area (3) Logistics Performance, that may because the China’s logistics infrastructure is imperfect, and the logistics market is still under developing, therefore, the overall logistics performance efficiency is not very high compared to developed countries. Results from ANOVA analysis reveal that, supply chain operational performance is different among ownership status. Hypothesis 2 is supported.

4.1.3 Comparative analysis on different regions

The purpose of this section is to make a statistic test for that whether regional disparity influences SCM operational performance in a significant level. The method of t-test is used in this section between different regions.

From the viewpoint of GDP per capita, the 236 respondents can be divided into two groups, as the top 3 of GDP per capita region and the others region. Because in recent 10 years, the top 3 of GDP per capita regions among all provinces, municipalities and autonomous regions in China have been always Shanghai, Beijing and Tianjin, which are significantly higher than other places.

Therefore, the top 3 of GDP per capita regions are divided into one group, and the other places are another group. Thus, the comparative analysis is conducted between these two groups.

Average total score and average area score from these two different regional groups are summarized and revealed in Table 5 and Figure 6 in terms of distribution chart.

From the distribution chart of companies which are from the top 3 of GDP per capita regions and the others places could be observed that two populations have different format of data distributed. The top 3 of GDP per capita regions group shows a form of skewness distribution to the left while the other places group is shown as a bimodal distribution.

The average total score of these groups are found at different level where the top 3 of GDP per capita regions produced higher scores than other places.

Further investigation has been carried out in detail for each area of assessment as shown in Table 5. As a result, it is clearly noticed that the companies which in the top 3 of GDP per capita regions performed better than other places with a fairly high significant level almost in each area, especially in the area (4) IT Methods and Implementation. That may because of the Chinese economic reform and development are uneven and unbalanced, the coastal region, especially Shanghai, Beijing and Tianjin, these kind of international metropolis have a good industrial infrastructure and sound internal and external communications links, which provide these regions with a distinct location advantage during the period of institutional transformation.

Especially, the information technology and telecommunication infrastructure construction, high-tech personnel education and training in these kind of metropolis are much better than other places in China, which result in the big difference between the top 3 of GDP per capita regions and the other places on the area (4) IT Methods and Implementation in a significant level, consequently, the Hypothesis 3 is supported.

4.2 Factor Analysis

This section is initiated in order to analyze the Chinese SCM structure based on the LSC data. The factor analysis is carried out in this process so as to extract potential factors which constitute an efficient supply chain structure influencing the SCM operational performance.

The factor analysis was conducted with 236 samples in this...
section, which is a statistical data reduction technique used to explain variability among observed random variables in terms of fewer unobserved variables, known as factors. The solution was performed by the principal axis factoring with varimax rotation in order to remain the independent relations among the extracted factors.

Three factors were extracted from Chinese data with the cumulative contribution rate at 57.34%. The factor matrix is shown in Table 6, and the items with factor loading more than 0.4 as well as the highest loading for each item are highlighted in boldface.

The result of the factor analysis reveals that Chinese respondents consider the SCM organization issues and technical issues independently. However, the results indicate a slight contradiction to previous research findings, that is, the analysis results both from Finland and Thailand revealed that supply chain organization strategy and IT utilization are considered together as one factor extracted from factor analysis [32].

The decisive difference could be explained by the fact that Chinese national culture is identified to the oriental Confucian culture, and it is also characterized as collective, high in power distance and long-term orientation [33]. Openness of knowledge sharing is related to collectivism, with in-group membership moderating this relationship, while, Chinese people shared significantly less with potential respondents who are not members of their in-group [34].

Therefore, Chinese people believe that the building of long-term collaboration with suppliers is very important, and the IT usage just plays a separated role as an enabler to achieve higher SCM performance. While, both Finland and Thailand seems to believe that effective IT utilization do assist in delivering right strategy about SCM throughout the organization as well as achieving a high degree of information sharing among business partners.

4.3 Factor Score Comparison

In this section, the extracted influential factors represent China’s SCM competency, the method of Two-way Analysis of Variance (Two-way ANOVA) was conducted in order to demonstrate whether the interaction between ownership status and regional disparity has a significant impact on supply chain operational performance. The result of the Two-way ANOVA is revealed in Table 7.

Result from the Two-way ANOVA indicates that the ownership status has a significant on SCM organization, regional disparity make a difference to IT utilization in a significant level, while, the interaction between ownership status and regional disparity influences the SCM organization ability. Since the culture differences have significant impact on the different ownership companies’ organizational culture and operational performance.

As for the Chinese people, make a long-term relationship with customers and suppliers is one of good representative capability for the SCM organization ability. Because polities, infrastructures, physical capital, labour market and human capital

| Table 5 | Average scores of four areas between different region group companies |
|--------|-----------------|---------|---------|-------|
|        | Top3 (67) | Others (158) | t-value |
| 1. Corporate Strategy and Inter-Organization Alignment | Ave. | SD | Ave. | SD |  |
| 2. Planning and Execution Capability | 3.56 | 0.88 | 3.30 | 0.87 | 2.05* |
| 3. Logistics Performance | 3.19 | 0.97 | 2.94 | 0.89 | 1.91 |
| 4. IT Methods and Implementation | 3.20 | 0.88 | 2.85 | 0.90 | 2.64* |
| Average Total Score | 3.32 | 0.83 | 2.95 | 0.83 | 3.10** |

* : 5% significant, **: 1% significant

| Table 6 | Rotated factor matrix of 236 companies |
|--------|-----------------------------------|
|        | Assessment Item | Factor (China) |
|        |                    | 1 | 2 | 3 |
| 1-(1) Corporate strategy regarding logistics and its importance | 0.379 | 0.270 | **0.582** |
| 1-(2) Definition of supplier contract terms and degree of info sharing | 0.249 | 0.227 | **0.700** |
| 1-(3) Definition of customer contract terms and degree of info sharing | 0.159 | 0.212 | **0.660** |
| 1-(4) System for measurement and improvement of CS | 0.415 | 0.210 | **0.602** |
| 1-(5) System for employee training and evaluation | 0.395 | 0.304 | **0.481** |
| 2-(1) Strategies for optimizing logistics system resources based on DFL | 0.399 | **0.505** | 0.374 |
| 2-(2) Understanding of market trends and accuracy of demand forecasting | 0.484 | 0.350 | 0.423 |
| 2-(3) Accuracy and adaptability of SCM planning | 0.516 | 0.321 | 0.430 |
| 2-(4) Control and tracking of inventory: accuracy and visibility | 0.468 | 0.344 | **0.515** |
| 2-(5) Process standardization and visibility | 0.546 | 0.401 | 0.457 |
| 3-(1) Just-In-Time | **0.588** | 0.427 | 0.297 |
| 3-(2) Inventory turnover and cash-to-cash cycle time | 0.672 | 0.379 | 0.240 |
| 3-(3) Customer lead time and load efficiency | 0.590 | 0.280 | 0.252 |
| 3-(4) Delivery performance and quality | 0.720 | 0.227 | 0.305 |
| 3-(5) Supply chain inventory visibility and opportunity costs | 0.554 | 0.431 | 0.302 |
| 3-(6) Environmental activities | 0.520 | 0.295 | 0.280 |
| 3-(7) Total logistics cost | 0.594 | 0.446 | 0.323 |
| 4-(1) Electronic Data Interchange (EDI) coverage | 0.283 | **0.667** | 0.199 |
| 4-(2) Usage of Bar Coding / AIDC | 0.527 | **0.647** | 0.137 |
| 4-(3) Effective usage of computers in operations and decision-making | 0.238 | **0.600** | 0.888 |
| 4-(4) Open standards and unique identification codes | 0.331 | **0.626** | 0.395 |
| 4-(5) Decision-making systems and support to supply chain partners | 0.339 | **0.565** | 0.336 |
are different among eastern, central and western regions, result in the significant difference on IT utilization ability among different regions’ companies.

Ownership status synergy regional disparity only has significant meaning on the SCM organization ability, which once again confirms that Chinese people believe the building of long-term collaboration with suppliers is very important, and the IT usage just plays a separated role as an enabler to achieve higher SCM performance. As a result, Hypothesis 4 is supported in a certain degree.

5. Conclusions

In this research, the SCM Logistics Scorecard (LSC) is utilized as an evaluating instrument to investigate the supply chain operational performance in China. The main studies are on comparing performance in different firm sizes, ownership status, and region companies, and the potential factors which constitute an efficient SCM in China, respectively.

As well, the synergy effect between ownership status, region disparity and SCM operational performance is analyzed based on the LSC data. The findings and implications are concluded as follows:

First, the preliminary comparison in different firm size participants’ data indicates that performance level scores from different observed firm size companies are statistically different. The scores of large and mega firms are higher than those of small and middle firms. In addition to the reason that is, compared to the small and middle companies, large and mega companies may have more geographically dispersed operations, more volumes of transactions, more supply chain partners, and more information to manage and thus, they would be more likely to adopt information technology systems to improve their SCM operational performance efficiency.

Especially in China, there are fewer preferential policies for small and middle companies, and they are difficult to get loan from financial institutions but the tax burden is very heavy, which lead to the small and middle companies are very difficult to develop and their operational performance is lower than the large companies. Whereas, small and medium companies are one the main forces which contribute to form the economic growth of China, that’s why lots of Chinese economists call on the Chinese government to make relevant policies to protect small and medium companies to develop in the future.

Second, the comparison in ownership status indicates that supply chain operational performance is significant differently between ownership status, state owned enterprises (SOEs) and foreign owned enterprises (FOEs) take up higher scores than private and individual enterprises (POEs), especially, the average score of area (1) Corporate Strategy and Inter-Organization Alignment is higher than other areas, which could be explained by China’s unique culture—Guanxi.

Guanxi, a system of personal connections that carries long-term social obligations, is held to play a significant role in business relationship in China [35],[36]. Guanxi is also operated as a governance mechanism which brings direct effects on market performance and indirect effects through channel capability and responsive capability in the transitional economy of China [37]. According to some previous research, Guanxi orientation is dependent on ownership status [38], and the POEs companies appear to have a stronger association with Guanxi related characteristics than those with SOEs [39].

However, building up Guanxi would take a lot of time and costs, and managers should also be aware of Guanxi’s risks including reciprocal obligations, corruption, ethical issues and so on.

Third, the comparison between the top 3 of GDP per capita regions and other place indicates that supply chain operational performance is significant influenced by the regional disparity, the top 3 of GDP per capita regions perform better than other places with fairly high significant level almost in every area. After the reform and opening policy, China’s regional development strategy plays an important role in determining whether regional development is balanced or unbalanced.

Because of the preferential policies and geography advantages, the eastern coastal regions have developed much better than central and western regions. Globalization and economic liberalization have significant influence on increasing regional disparity [40]. In order to converge to the regional disparity, the Chinese government has formulated The West China Development Strategy, Revitalize the Old Northeast Industrial Bases and Promotion to The Rise of Central China to promote the development of the western, north eastern and central regions and attract foreign investment to there.

In addition, human capital is a determinant factor which influences regional economic disparity. Therefore, investment in education is an important way to reduce regional disparity in China. That is why the Chinese government has been paying much more attention to educational reform, emphasizing human resource cultivation and seeking to upgrade the overall quality of the labor force.

Fourth, the results of factor analysis indicate that the potential factors which impact Chinese supply chain performance structure are different from previous research. The most significant difference is that the IT usage is not identified as a unique factor from Thai and Finnish data sets, but as an independent factor in China. The result may be explained by that, Chinese people believe the building of long-term collaboration with business partners is very important, and the IT usage just plays a separated role as an enabler to achieve higher SCM performance.

Meanwhile, both Finland and Thailand seem to believe that effective IT utilization cooperating with strategy throughout the organization could achieve a high degree of SCM operational performance.

Finally, the analysis result between three extracted factors

| Ownership status | Responsiveness | IT Utilization Ability | SCM Organization Ability |
|------------------|----------------|------------------------|--------------------------|
| Ownership disparity | 0.109 | 1.588 | 5.236* |
| Ownership * Region | 0.374 | 14.229** | 0.201 |
| Ownership * Region | 0.132 | 0.019 | 2.601* |

* : 5% significant, **: 1% significant
which represent China’s SCM competencies and the ownership status, regional disparity and the interaction of ownership status and regional disparity indicates that, ownership status has a significant difference to SCM organization ability, IT utilization ability is different among each region, while, ownership status synergy regional disparity only has significant meaning on the SCM organization ability, which once again confirms that Chinese people believe the building of long-term collaboration with suppliers is more important, and the IT usage just plays a separated role as an enabler to achieve higher SCM performance.

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Appendix

All the assessment items of LSC with descriptions of level5.

| Area | Item | Level 5 |
|------|------|---------|
| 1. Corporate Strategy and Inter-Organization Alignment | 1-(1) Corporate strategy regarding logistics and its importance | Under the CEO’s leadership and a clear corporate strategy, there is an company-wide system that supports rapid adaption of the supply chain to environmental change. |
| 1-(2) Definition of supplier contract terms and degree of info sharing | Formal written agreements exist with nearly all suppliers. Company has a well-established approach for seeking win-win solutions based on strategy and information sharing. |
| 1-(3) Definition of customer contract terms and degree of info sharing | Formal written agreements exist with nearly all customers. Company has a well-established approach for seeking win-win solutions based on strategy and information sharing. |
| 1-(4) System for measurement and improvement of CS | In addition to Level 4, the results of customer satisfaction surveys are shared with relevant customers and are used in the joint development of products/services. |
| 1-(5) System for employee training and evaluation | In addition to Level 4, there is a knowledge management system for sharing knowledge and know-how at the team and organization level. |

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Jingjing Gong

was born in China 1983. She is a doctoral course student in the Department of Industrial Engineering and Management, Graduate school of Decision Science and Technology, Tokyo Institute of Technology, Japan. She received her bachelor degree and master degree in Jilin University, China in 2007 and 2009 respectively. Now, her research areas focus on logistics and SCM, new product development and cultural researches.

Sadami Suzuki

was born in Japan 1973. He is an Associate Professor in Industrial Engineering and Management, Graduate school of Decision Science and Technology, Tokyo Institute of Technology, Japan. He received his B. Eng., M. Eng. and Dr. Eng. from Tokyo Institute of Technology in 1998, 2000, and 2007 respectively. His research areas focus on SCM, production and operations management, customer satisfaction and loyalty.

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Table A.1 Area 1 and 2 of LSC
### Table A.2 Area 3 of LSC

| Area | Item | Level 5 |
|------|------|---------|
| 3-(1) | Just-In-Time | JIT activities are synchronized throughout the material flow and involve suppliers and customers. |
| 3-(2) | Inventory turnover and cash-to-cash cycle time | Exceeds Level 4, with inventory measured with accuracy at the hours-level and actual performance of 24+ turns/year. Cash-to-cash cycle time is less than 10 days. |
| 3-(3) | Customer lead time and load efficiency | In addition to Level 4, achieves load efficiency of 80% or higher. |
| 3-(4) | Delivery performance and quality | In addition to Level 4, suppliers and customers are involved in improvement efforts. While maintaining high performance, efforts to improve efficiency, elimination of incoming inspections, are promoted. |
| 3-(5) | Supply chain inventory visibility and opportunity costs | Inventory levels are known throughout the entire supply chain. Estimation is made of opportunity cost of lost sales at the end demand level. |
| 3-(6) | Environmental activities | In addition to Level 4, efforts also involve product design and development to consider design for logistics, design for environment, and other life cycle issues. |
| 3-(7) | Total logistics cost | In addition to Level 4, total logistics costs throughout the supply chain are known and shared among supply chain members. Win-win scenarios for cost reduction are developed from the viewpoint of supply chain optimization. |

### Table A.3 Area 4 of LSC

| Area | Item | Level 5 |
|------|------|---------|
| 4-(1) | Electronic Data Interchange (EDI) coverage | EDI is used for nearly all transactions and is integrated with internal systems. Open standards for EDI are adopted or in-process of adoption. |
| 4-(2) | Usage of Bar Coding / AIDC | The best mix of bar codes, 2-dimensional symbols, IC tags and other AIDC methods are linked with EDI, and used to support innovation of the logistics system at the supply chain level. |
| 4-(3) | Effective usage of computers in operations and decision-making | ERP, SCM, CRM and other IT tools are utilized for planning and optimization of the entire supply chain. Outsourcing and other means are considered for increasing the effective use of IT and related resources. |
| 4-(4) | Open standards and unique identification codes | In addition to Level 4, unique identification codes are extended to both suppliers and customers. Company is actively working towards adoption of open standards for EDI and other IT applications. |
| 4-(5) | Decision-making systems and support to supply chain partners | Have succeeded in implementing win-win solution with supply chain partners, actively provide proposals, support to partners to improve their systems and innovate the supply chain. |