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Integrative approaches of Electronic Supply Chain Management in automotive industry performance evaluation

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Abstract

This research aims "to study the approaches of electronic supply chain management on performance evaluation in the automobile industry." Therefore, the research method used in this research is applied, descriptive, and correlational. The statistical population of this research is the experts of the Ministry of Privacy. Out of 250 people, according to the Cochran formula, 148 people were selected as a sample. To measure the variables in the current research, the standard questionnaire in the base article was used, which was measured in a five-point Likert spectrum with a total of 19 questions. The face validity of this questionnaire has been given to specialists and experts such as the honorable teacher, and Cronbach's alpha test also tested its reliability. Many tables and graphs will be used to describe the findings. The Kolmogorov–Smirnov test measures the variables to confirm and disconfirm the normal distribution of the data. The structural equation test will be used in the PLS software environment to fit the model used in the research. The findings of the research showed that the environmental factor of the sustainable supply chain with the mediating role of digital-based supply chain integration is influential in evaluating the performance of the automobile industry. Finally, practical suggestions were presented.

Keywords: supply chain, supply chain integration, automotive industry

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1- Introduction

Today, much attention has been paid to the supply chain and production based on sustainable development goals in manufacturing companies (Fathollahi-Far, 2022). Supply chains are the key links that connect the company's inputs to its outputs. It is an inter-company approach that includes the supplier, the suppliers to the consumer, and the consumers. This factor is a strategic effort to achieve social, environmental, and economic goals that can establish relationships between suppliers and the company's business processes by coordinating systematic factors. Sustainable supply chain management has two dimensions, environmental and social aspects, which establish a connection between the performance of the company's activities (Lee, 2022; Gharachorloo et al., 2021; Movahed et al., 2023, Ghahremani-Nahr et al., 2023). The challenges the company faces are reducing costs, ensuring on-time delivery, and reducing time to better react to the business environment, which increases environmental costs in these networks and the growth of consumer pressure.

In the era of digital transformations, planning systems enable supply chain models to operate more strongly; these factors are a popular method to strengthen the traditional supply chain (Nozari et al., 2023). Digitalization-based supply chain integration has increased visibility in companies' supply chains. This factor has reduced the uncertainty caused by changes in orders and demand fluctuations in companies, and according to these cases, manufacturing companies have tried to integrate materials and information and synchronize inter-organizational processes in line with the operational efficiency of the supply chain. Increase their activity (Lee, 2022; Aliahmadi et al., 2013, Bathaee et al., 2023). The development of new technology in production units has been a sign of digital transformation in companies and the change of performance improvement in supply chain management. This factor can increase the data produced in the globalization of supply chain management and strengthen an ecosystem dependence of the digital supply chain (Stroumpoulis & Kopanaki, 2022; Fallah et al., 2021, Aliahmadi et al., 2016). According to the issues raised, conventional approaches to supply chain integration face the challenges of updating and digitalization in companies. The consequences of digitalization in the supply chain of automobile manufacturing companies have been little discussed. This research discusses how sustainable supply chain management facilitates inter-organizational integration in a supply chain and leads to activity competition. Sustainable supply chain management in environmental and social factors can create a perspective for suppliers of manufacturing companies, which shows the relationship between sustainable supply chain management, digital-based supply chain integration, and operational performance in different environments of automobile manufacturing companies (Aliahmadi & Nozari, 2023 , Tavakkoli-Maghaddam et al., 2022).

Such a difference may cause some sustainability practices at different levels of implementation in companies, and these factors can change the effects of sustainable supply chain management in manufacturing companies and create fundamental differences in companies.

2- Literature Review

Hautala Kankanpaa (2022) researched "The Impact of Digitalization on Company Performance: Examining the Role of Digital Culture and the Impact of Supply Chain Capability." The above study aimed to investigate the impact of digital platforms and supply chain capability on the operational performance of the company and the mediating effect of supply chain capability. In addition, its purpose was to investigate the moderating effect of digital culture and to increase knowledge regarding how organizational culture as a contextual factor affects the company's digitalization. Data were collected from 194 Finnish

manufacturing companies, and structural equation modeling was used to test the hypotheses. The findings show that digital platforms positively and significantly affect supply chain capabilities. In addition, supply chain capability mediates the relationship between digital platforms and firm operational performance.

Wong and Teng (2022) researched "Digital Innovation and Firm Environmental Performance: The Mediating Role of Supply Chain Management Capabilities." Due to the pervasiveness of the ongoing pandemic caused by the coronavirus disease, its potential spread can be minimized through social distancing. However, this practice increases the difficulties and makes traditional transactions or interactions undesirable. Accordingly, various companies around the world have become more committed to not only accelerating the development of digital technologies but also to integrating them into existing processes. The above study investigates how manufacturing companies can adapt to the changing volatility and unpredictable global business environment and achieve sustainable growth by developing supply chain management capabilities. Therefore, two questions are raised: How do supply chain management capabilities help the company's environmental performance? Moreover, what are the sources of such capabilities? Using survey data from 272 manufacturing companies in China, the relationship between three key factors of digital innovation (i.e., product, platform, and service) and the company's environmental performance was investigated. The findings suggest that digital products, platforms, and service innovations all have a positive contribution to supply chain management capability.

Tseng et al. (2022) have conducted a study entitled The Investigation of Sustainable Supply Chain Management in Stakeholders on Supporting Sustainable Supply in the Healthcare Industry in Vietnam; sustainable supply chain management is a growing concern in environmental, social, and economic performance. This research method is fuzzy Delphi, and exploratory factor analysis is used to validate criteria and confirm certain aspects. The results show that sustainable supply and process management are the main aspects of this research in the care industry. Investment health has not been observed and has reflected a weak interaction of activities; the five main supplier evaluation criteria include environmental management systems, supplier green certification, and supplier cooperation in safety and health.

Lee (2021) researched "Sustainable Supply Chain Management, Digital-based Supply Chain Integration, and Firm Performance: A Cross-country Empirical Comparison between South Korea and Vietnam." The issues of sustainability and digitization in supply chain management have received the attention of academic and business circles. However, few studies have addressed this issue in an integrated manner. In this regard, the above study examined the relationships between sustainable supply chain management, digital-based supply chain integration, and the performance of supplier companies in South Korea and Vietnam. The statistical sample included 248 companies out of 850 small and medium-sized Korean exporting companies, of which 187 samples were analyzed. Then, the same survey was conducted on Vietnamese exporting companies that supplied their products to large global companies. A total of 219 responses were collected from 682 Vietnamese exporting companies. The above study used 193 data for analysis. The above study's findings indicate that sustainable supply chain management facilitates the adoption and implementation of supply chain integration using digital technologies and leads to the operational competitiveness of suppliers. Also, the findings show the differences and similarities of sustainable supply chain management and its effects on the two countries' economies.

3- Research method

In terms of method, this research is descriptive and correlational; in terms of the type of supervision and degree of control, this research is among field research because the researcher examines the variables in their natural state. Regarding the goal, Research is at the level of applied research. Statistical population is

an abstract concept of a large group of cases from which the researcher selects a sample and then generalizes the results obtained from the sample to it. The sample is the unit of analysis or a case from the studied society. This member can be a person, group, organization, document symbolic message, or even a social action measured in the research process (Sekaran, 2013)—reasons for using a sample instead of collecting data from the entire statistical population. Collecting information from every member or testing him is practically impossible. Addressing time, cost, and other human resources issues is impossible, even if possible. Studying a sample group instead of the entire statistical population may sometimes lead to more valid results. Mainly because there will be less fatigue and fewer errors in the information collection, especially when the members of the statistical population are huge (Sekaran, 2013), among which the research population is experts. There are 250 people in the Ministry of Privacy, and 148 were selected using Morgan's table.

4- Data analysis

In order to test the hypotheses, structural equation modeling with partial least squares (PLS) approach and Smart PLS2 software are used. Data analysis is also based on the algorithm of data analysis in the partial least square's method, which includes two parts: "model fit check" and "research hypothesis test". Cronbach's three alphas measure the reliability of the index: composite reliability and shared reliability. According to the data analysis algorithm in the partial least squares (PLS) method, it is time to examine Cronbach's alpha coefficients and composite reliability. Cronbach's alpha coefficients and composite reliability of constructs indicate the variance ratio between each construct and its indicators to the variance of the whole construct. A reliability coefficient higher than 0.7 is considered acceptable. The results of reliability coefficients are as follows. According to the results in the table below, all the factors have an acceptable composite reliability coefficient. Also, Cronbach's reliability coefficient is acceptable; Shared reliability, which pays attention to the generalizability of a question, means that the real meaning of reliability is that the acceptable value should be higher than 0.5. Therefore, it can be concluded that the research questionnaire has adequate reliability. As a result, the appropriateness of the measurement model is also confirmed.

Table 1: Reliability coefficients of the questionnaire

Variable	Cronbach's alpha $\alpha > 0.7$	Composite reliability CR > 0.7	Shared reliability COMMUNALITY>0,5
Environmental factor of sustainable supply chain	0/812	0/803	0/623
The social factor of sustainable supply chain	0/813	0/873	0/696
Electronics supply chain integration	0/803	0/871	0/683
Performance evaluation	0/732	0/813	0/618

In this research, three conditions should be used to investigate the convergent validity. If these conditions are not met, there is no convergent validity. The index of factor loadings of the significant coefficients t should be outside the range (1.96 and -1.96) if it is within the limit of these numbers. The desired question is deleted, and the following index of standardized factor loadings, which must be above 0.4, is unacceptable; if it is below 0.4, the question is deleted, and the following index, average variance extracted (AVE), is used. AVE shows the degree of correlation of a structure with its indicators. Fornell and Larker

(1981) introduced this criterion to measure convergent validity and stated that the critical value of this value is 0.5. This means that a value above 0.5 shows acceptable convergent validity.

Table 2- Convergent validity of model constructs based on AVE

variable	AVE
Environmental factor of sustainable supply chain	0/698
The social factor of sustainable supply chain	0/612
Electronics supply chain integration	0/623
Performance evaluation	0/613

As can be seen in the table, the value of AVE for all the model constructs is at least 0.5. As a result, the model's convergent validity and the measurement models' fit are confirmed.

Fornell and Larcker used divergent validity to show the independence of the research concepts, the results of which are presented in the table below. As can be seen in the table, the root value of AVE (numbers on the primary diameter) of all the hidden variables of the research is higher than the correlation value between them and other variables, which shows the appropriate divergent validity of the measurement models.

Table 3- The results of examining the validity of the model based on Fornell and Larcker's matrix

Main variables	1	2	3	4
Electronics supply chain integration	0/788			
The social factor of sustainable supply chain	0/608	0/751		
Environmental factor of sustainable supply chain	0/509	0/591	0/813	
Performance evaluation	0/611	0/573	0/411	**0/719**

Structural model

The figure below is the structural model after performing the desired tests

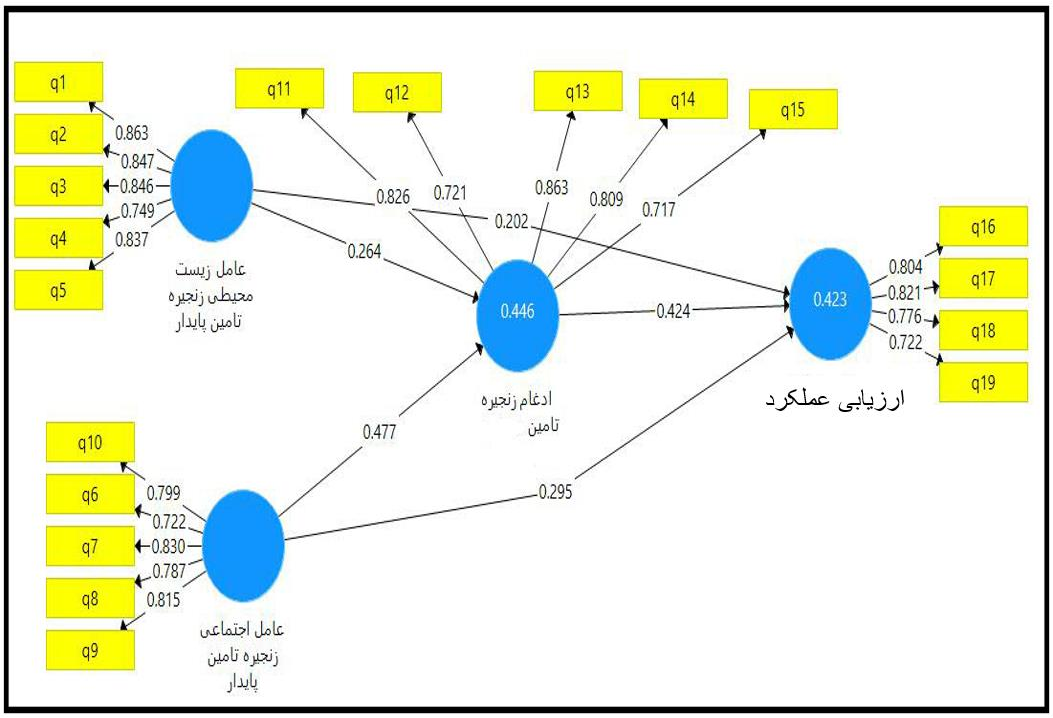

Figure 1: Structural model in path coefficient estimation mode

After checking the fit of measurement models, structural models, and general models, in accordance with the data analysis algorithm in the PLS method, and the Sobel test to check the mediating relationship in the research variables, the researcher is allowed to check and test the research hypotheses.

Table 4: Mediation hypotheses based on Sobel test

Raw	Assumptions	p-value	Results
1	The environmental factor of the sustainable supply chain, along with the mediating role of electronic supply chain integration, affects the performance evaluation of the automotive industry.	0/000	Confirmation of the hypothesis
2	The social factor of the sustainable supply chain with the mediating role of electronic supply chain integration affects the evaluation of the performance of the automobile industry.	0/000	Confirmation of the hypothesis

Table 5: Research hypotheses

Raw	Assumptions	direct route	Significance coefficient	Results
1	The environmental factor of the sustainable supply chain affects the integration of the electronics supply chain of the automotive industry	0/264	2/57	Confirmation of the hypothesis
2	The social factor of the sustainable supply chain affects the integration of the electronic supply chain of the automotive industry.	0/477	3/78	Confirmation of the hypothesis
3	The environmental factor of the sustainable supply chain affects the evaluation of the performance of the automobile industry.	0/202	2/007	Confirmation of the hypothesis
4	The social factor of the sustainable supply chain has an impact on the evaluation of the performance of the automobile industry.	0/295	2/361	Confirmation of the hypothesis
5	Digital-based supply chain integration effectively evaluates the automotive industry's performance.	0/424	2/493	Confirmation of the hypothesis

5- Conclusion

There is a positive influence between the environmental factor of the sustainable supply chain and the integration of the electronic supply chain. There is a positive influence between the integration of the electronic supply chain on the evaluation of the company's performance. In general, the environmental factors of a sustainable supply chain affect the company's performance evaluation. According to the impact between all the primary and secondary hypotheses, it can be concluded that the influence of the mediating factor of the electronic supply chain integration, the environmental factor of the sustainable supply chain on the evaluation of the company's performance is acceptable, the results obtained with the findings of Lee (2022) of the effects The positive and significant mediating factor of digital-based supply chain integration is the environmental factor of the sustainable supply chain on the company's performance, which has the necessary alignment. Also, because there is a positive influence between the social factor of sustainable supply chain on the integration of electronic supply chain and There is a positive effect between the integration of the electronic supply chain on the company's performance and, in general, the social factor of the sustainable supply chain also has an effect on the company's performance, according to the effect between all the primary and secondary hypotheses, it can be concluded that the influence of the mediating factor of the supply chain integration Electronics, the social factor of the sustainable supply chain is accepted for the evaluation of the company's performance, the results obtained with Lee's (2022) finding of the positive and significant effects of the mediating factor of digital-based supply chain integration, the social factor of the sustainable supply chain on the company's performance, which is from alignment According to the structural model of the research, it can be seen that the level of significance between the process of the environmental factor of the sustainable supply chain on the integration of the electronic supply chain in the automotive industry is significant, so the results obtained with the results obtained with the findings of Lee (2022)) of the positive and significant effects between the process of the environmental factor of the sustainable supply chain on the integration of the electronic supply chain, which has the necessary alignment. Therefore, it is suggested that digital technologies such as the Internet of Things (IoT), Blockchain, and artificial intelligence be used. (AI) to improve monitoring and control in the supply chain can help the company improve production, distribution, and inventory management processes and ensure

the supply chain's stability. Working with sustainable suppliers and choosing suppliers who adhere to sustainability standards and offer sustainable products and services can help make your supply chain more sustainable. Examining and evaluating suppliers' performance in environmental, social, and economic issues can help you choose sustainable suppliers. Improving transparency and dissemination of information to increase transparency in the supply chain by disseminating information related to processes, raw materials used, workers' conditions, and environmental impacts can help you inform customers and other stakeholders about your sustainability efforts. This information dissemination can help you gain customer trust and promote responsible marketing. Optimization of logistics and inventory management: optimizing logistics and inventory management methods can help you reduce costs, improve delivery time, and increase productivity. Promoting sustainability in the supply chain by examining and improving the processes in the automotive supply chain, from parts production to distribution and recycling, can help you reduce energy consumption, greenhouse gas emissions, and environmental impacts and improve fuel efficiency and material use. Recycling and promoting sustainable production processes can help you achieve your sustainability goals.

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