

-RESEARCH ARTICLE-

SUPPLIER INVOLVEMENT ENHANCED THE KNOWLEDGE-PROCESSING CAPABILITIES OF PARTS MANUFACTURERS ON COMPARISON COMPOSITE MULTIGROUP MODELS

Piyachat Jarutirasarn

Department of General Management,
Faculty of Business Administration,
Ramkhamhaeng University, Bangkok, Thailand
ORCID: <https://orcid.org/0000-0001-7578-8080>
Email: Piyachat.j@rumail.ru.ac.th

Thanawatdech Thirapatsakun*

Committee for PhD Dissertation
Examination, Independent Scholar, Bangkok, Thailand.
ORCID: <https://orcid.org/0000-0002-2582-2858>
Email: thanawatdech19@gmail.com (Corresponding author)

—Abstract—

Thailand is not only advancing its automotive manufacturing capabilities but also actively developing a localized supply chain and ecosystem through strategic partnerships with automakers and local parts manufacturers to support electric vehicle (EV) production. This study investigates the role of suppliers as co-creators and knowledge sources in the EV industry, utilizing structural equation modelling (SEM) to analyse relationships between market segments and EV manufacturing bases. To assess suppliers' role as knowledge contributors, the study applied measurement invariance of composite models through Partial Least Squares Structural Equation Modelling (PLS-SEM) and employed the MICOM approach to evaluate measurement invariance in composite modelling. Data were collected from 550 manufacturers, comprising 312 original equipment manufacturers (OEMs) and 238 replacement equipment manufacturers (REMs) in various locations, selected through random sampling. The findings underscore the predictive power of model evaluations and comparisons in supporting theoretical development and validation. Results indicate that supplier participation as a knowledge source is shaped by organizational management structure,

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alongside political and regulatory influences. Notably, REMs exhibited a greater emphasis on knowledge processing than OEMs, as OEMs appeared less impacted by management structures and types of supplier co-creation. Further analysis reveals that supplier co-creation mediates the interaction between management structure and organizational nature, highlighting its pivotal role in the knowledge development process within Thailand's EV manufacturing ecosystem.

Keywords: The Electric Vehicle Parts Manufacturer, Business Environment, Original Equipment Manufacturers, Replacement Equipment Manufacturers, The Measurement Invariance of Composite Models

INTRODUCTION

Key investments in Thailand's EV sector include the development of a comprehensive EV ecosystem that goes beyond vehicle production. Automakers have announced partnerships with local parts manufacturers to support local electric vehicle production. Additionally, the country is working on developing a localized supply chain to support the sector's growth. This effort is demonstrated by the supply chain development, which aims to support the formation of electric vehicle and component industry operators. The promotion plan is called the "Electric Vehicle Promotion Roadmap in Thailand" or "EV Promotion Roadmap," and it aims to establish Thailand as the core of electric vehicle manufacturing in the ASEAN region (Nolan, 2024; Promotion, 2019). Consequently, accelerating the electric vehicle's market dominance is rapid, directly impacting the automotive component industry. However, the manufacturers of auto components are affected by the electric vehicle manufacturing process. However, they must acquire technology and innovation because the car assembly plant sets the standard. This group encompasses manufacturers of auto parts. They are required in electric vehicles, such as the chassis, undercarriage, and passenger compartment interior components. They must also adapt if they are network corporations or have a relationship with the manufacturer. Adjust early on to receive a technology transfer from technology owners and enter the production chain of the modern electric vehicle industry (Yongpisanphob, 2022).

Most Thai entrepreneurs belong to medium-sized component manufacturers at the pyramid's base. Consequently, there is a high risk of being impacted if OEM manufacturers make significant structural modifications to entirely electric vehicles. More than 2,000 small and medium enterprises (SMEs) supply raw materials or components to entrepreneurs in the supply chain, at the pyramid's summit (Compass, 2021). Industry trends inspired this study. Although electric car components and equipment makers' innovations improve corporate success, they are among the established organizations that have innovated. However, this is not enough. Efficiently invest resources to produce the right products for new electric vehicle components and

equipment makers, resulting in superior performance, education, knowledge, and competency. Sustainability factors must be identified. Improve the commercial capability of new energy vehicle components and equipment producers (Yongpisanphob, 2022). Supplier sustainability challenges frequently develop upstream. New product success depends on supplier involvement. Therefore, the strategy needs two categories of electric vehicle components and equipment vendors as knowledge sources and co-creators. New electric vehicle component and equipment manufacturer knowledge processing. It boosts supplier participation as a source and contributor to improve the firm's knowledge-processing ability. Knowledge suppliers and co-creators enable business capabilities. Especially Supplier involvement helps organizations learn about sustainability challenges (Li et al., 2017). Based on the identified research gaps, the study makes several contributions. First, several models are tested on the relationship between the business environment, supplier involvement as a co-creator, supplier involvement as a knowledge source, and knowledge-processing capabilities; this study is one of the first to assess the impact of the business environment on supplier involvement as a co-creator and supplier involvement as a knowledge source.

Second, with limited research on the outcomes of the business environment, the study seeks to find the business environment indicators in the technological, social cultural, political, and legal environments, as well as management structure and nature. Third, previous studies on supplier involvement as a co-creator, supplier involvement as a knowledge source, and knowledge-processing capabilities have continuously emphasized the role of mediators. The study further helps explain the mechanism of the impact of the business environment on knowledge-processing capabilities. Hence, the study will add an understanding of how the business environment can foster improved knowledge-processing capabilities. Fourth, this paper demonstrates the role of the business environment through cross-business type analysis between two diverse original equipment markets (OEM) and replacement equipment markets (REM), since there have been significantly limited studies on the business environment and its outcomes in a cross-business type setting. Fifth, the research contributes to business capabilities in the electric vehicle industry and further understands the knowledge-processing capabilities theory to assess the relationship between the business environment and how it influences the proposed mediators (supplier involvement as a co-creator, supplier involvement as a knowledge source) that lead to improved knowledge-processing capabilities. Finally, this study delivers an in-depth analysis and a comparison of the available procedures to statistically assess differences between business types of research between two diverse OEM and REM in multi-group-specific parameters in PLS-SEM path modelling. In addition, it is appropriate to identify no, partial, and full measurement invariance using the MICOM approach. This study offers a valuable approach for evaluating measurement invariance when dealing with

composite models. Before doing multi-group analyses, researchers in various fields, including international marketing, must carry out this form of assessment. As a standard means value, they can assess the measurement invariance using the MICOM approach (Henseler et al., 2016).

REVIEW OF LITERATURE

Business Environment

Hans (2018) posits that a notable degree of importance is present. The concept of the "business environment" encompasses a multitude of internal and external factors that exert an influence on the operational context of a company. The factors encompass personnel, customer relations, market dynamics, and regulatory frameworks. The business environment comprises a range of factors, such as customers, suppliers, competitors, owners, technological advancements, legal and governmental activities, and market, social, and economic trends. Before, Agbolade Obasan (2014) proposed that a business's success depends on its capacity to adapt to the current business environment in which it operates. The concept of "business environment" refers to the entirety of external influences, circumstances, and establishments that lie outside the purview of a business and impede its functioning, thereby impacting the operations of business entities. The as-stated entities encompass a range of factors, namely customers, competitors, suppliers, governments, and social, political, legal, and technological considerations. According to Akpoviro and Owotutu (2018) research, a business environment encompasses utilizing all factors that surround a business organization and impacts decision-making, strategic planning, operational processes, and the overall performance of the business. The business environment encompasses a range of factors that fall under the categories of social, technological, economic, legal, and political (STEP). These factors are typically outside of the control of the business. Contemporary business organizations face a situation that can be viewed as an opportunity or a threat. The statement mentioned above pertains to a modification. Competitive pressure is the primary driver of the most dynamic change. In response to a vibrant and unpredictable business environment, competitors employ various strategies to adapt. The business environment exhibits the following traits: (1) The business environment encompasses all external factors that affect the operations of a business entity. (2) The elements encompass factors and powers, namely customers, competitors, suppliers, governments, and social, cultural, political, technological, and legal conditions. (3) The dynamic nature of the business environment is a well-established fact. This implies that it undergoes perpetual modifications. (4) The unpredictability of alterations in the business environment is a notable characteristic. Forecasting the precise characteristics of future occurrences and changes in the socioeconomic environment is challenging. There is variation in the business environment across different locations, regions, and countries. The business environment was examined in the study as follows:

Social and Cultural Environment

The social and cultural environment pertains to individuals' beliefs and values regarding labour and financial prosperity. The significance of various social factors, including family, marriage, religion, education, and the social environment of business, encompasses customs, values, beliefs, poverty, literacy, and the life expectancy rate (Hans, 2018). The social and cultural environment contains various social factors, including but not limited to customs, traditions, values, beliefs, literacy, and life expectancy. The influence of societal norms and values on operations is significant. The social and cultural environment comprises a range of factors, such as cultural components and health awareness. The subject of inquiry concerns the relationship between population growth rate and age distribution. The person displays a demeanour characteristic of a professional and places significant importance on safety. The examination and analysis of the influence of social factors on a company's operations and product demand is a topic of ongoing interest. The phenomenon of an aging population has the potential to result in a decline in the labour force's size and a decrease in its level of participation. Moreover, it has been noted that corporations may modify their managerial strategies in reaction to current societal patterns, such as the employment of senior employees (Akpoviroro & Owotutu, 2018).

Technological Environment

Significant transformations have occurred in the technological landscape over the last three decades, particularly in vehicle industries. The significance of this cannot be overstated for corporations. To stay abreast of these modifications, the creation of new products is not the only reason. In addition to being innovative, it confers upon them a competitive edge (Yoo et al., 2015). In addition, technological factors encompass research and development endeavours and automation. The relationship between technology incentives and the pace of technological advancement. They can establish barriers to entry—the determination of an efficient minimum production level and its impact on the decision-making process regarding outsourcing. As Akpoviroro and Owotutu (2018) mention, technological advancements significantly impact expenses and excellence and pave the way for originality.

Management Structure and Nature

Management structure and nature pertain to the hierarchical arrangement of an organization's tasks and subtasks. This paper aims to analyse the organizational structure and composition of the Board of Directors. Professionalism among executives is a significant determinant in shaping business decisions. Some management structures and styles tend to impede the process of decision-making. Some individuals possess the ability to make prompt decisions. The board is the preeminent governing entity, guiding the organization's growth and overseeing its operations. Consequently, the calibre of the

board assumes a pivotal role in establishing and functioning an enterprise (Hans, 2018).

Political Environment / Legal Environment

Ongeti (2014) conducted a study that observed that the political factors encompass government regulations on business and political instability, which have extended to the scope of planning. This has resulted in a lack of clarity and stability in trade. The legal framework dictates the actions an entity should undertake or refrain from undertaking. Political considerations also influence the degree and manner in which the government intervenes in the economy. Political factors encompass various concerns, including but not limited to tax regulations, labour regulations, environmental regulations, trade limitations, tariff levels, and political steadiness. Political factors encompass the goods and services the government desires or obtains. The impact of governments on a nation's health, education, and infrastructure is significant (Akpoviro & Owotutu, 2018). According to Hans (2018), political factors refer to the actions of the government and the prevailing political environment that may impact one's business. Under this category are legal statutes, governmental policies, levies, and additional impediments to commerce, armed conflicts, and civil turmoil. Illustrative instances encompass modifying legislation intended to constrain or bolster the circumstances. The legal environment encompassed the legal statutes and domestic protocols that small and medium-sized enterprises (SMEs) adhere to throughout their business activities. The laws in question have the potential to facilitate favourable outcomes for businesses while also impeding the effective execution of responsibilities. As posited by Okeyo (2014), the political milieu in which business entities operate connotes that risk exposure is a gauge of the probability of a political occurrence transpiring. Various factors, including direct consequences such as taxes or fees and indirect effects such as opportunity costs, can complicate the pursuit of income.

Supplier Involvement as a Knowledge Source, and as a Co-Creator

Supplier involvement as a means of a source of knowledge and as a co-creator acquisition in ideating and developing novel product innovations is a crucial component of a sustainable approach. This enables them to gain entry and assimilate novel information from vendors pertaining to new product categories. The optimization of new products is facilitated by implementing effective research and development procedures, as highlighted (Jean et al., 2014; Ponomariov & Toivanen, 2014). The involvement of suppliers as knowledge sources and co-creators aligns with the findings of the Cheng (2020) study from a theoretical standpoint. One could argue that it qualifies as a form of management intervention. The objective is to convert the knowledge gained from supplier participation into innovative new products. Adopting a high-sustainability approach can potentially enhance the efficiency of new product innovation. However, the effects of implementing a sustainability strategy may vary. An organization's capacity to comprehend its stakeholders' requirements and acquire

and convert knowledge into innovation is contingent upon various factors, as suggested by [Dangelico et al. \(2013\)](#). According to [Claudy et al. \(2016\)](#) the various requirements of stakeholders serve as a compelling incentive to create novel products that cater to their demands.

Knowledge-Processing Capabilities

As innovation literature emphasizes the importance of utilizing external sources of knowledge in innovation activities, the suggested relationship between absorbing the company's innovative capacity and performance is apparent. The capability of the business to incorporate new ideas and methods. That depends on the prior background of pertinent knowledge. The capacity to absorb is the capacity "to recognize the value of new information, assimilating and commercializing it" or "to evaluate and make use of external knowledge." Other assessments include those conducted at the individual, intercompany, industrial, and national levels. Make use of the theoretical structures of adsorption capacities. Openness to external sources and ideas in the company's innovation process includes partner interactions. It is of high importance to create value through innovation activities. Companies rely on customers, suppliers, and other complementary capabilities. More as a product and process improvement innovator and source of new ideas to use the knowledge generated outside. They need the ability to internalize. It then integrates new information and insights into the existing knowledge base. To take advantage of the knowledge included in the product and process. Therefore, companies need structures, work processes, and tools for data acquisition, knowledge creation, and utilization. Thus, a firm capability exists in knowledge-processing capabilities to transform integrated knowledge into innovation ([Ponomariov & Toivanen, 2014](#)). In the emerging domains of organizational learning and knowledge management, a study was conducted to describe the impact of knowledge practices on organizational performance.

Hypothesis Development

The enterprises must adapt to the swiftly evolving business environment to endure. Consequently, it is imperative to devise and execute suitable tactics to safeguard activities and yield the intended outcomes. Previous research shows that a comprehensive understanding of the business environment is crucial for firms to operate effectively in size and industry. A group of suppliers facilitates the provision of direct access to external stakeholders. Acquiring additional or alternative insights into stakeholders' requirements is a potential benefit for the organization. According to [Isaksson et al. \(2016\)](#) and [Yeniurt et al. \(2014\)](#), this process facilitates the creation of novel products. Developing a new product is regarded as a knowledge management process in the context of external knowledge. In a previous study, a knowledge-based view was employed to scrutinize the knowledge management process within

organizations. In addition, Cheng (2020) posits that a theoretical foundation is established for comprehending the effects of sustainability orientations and supplier engagement on new product performance through interactions and the perspective of the knowledge base. The companies are institutions that facilitate the development and integration of knowledge. Knowledge is generated through experiential learning and transferred within and between companies, ultimately leading to value creation (Moeen & Agarwal, 2017). In addition, using supplier involvement as a source of knowledge helps companies connect to external resources in new product development (Menguc et al., 2014; Yenyurt et al., 2014).

Various participants identify and select workable knowledge to create new products. However, supplier involvement as a co-creator allows diverse participants to expand their existing technology. Open to various new technologies. Whereas, gating new product R&D functions, the costs associated with research and development should decrease due to leverage. Improve the effectiveness of research and development to produce better new product development outcomes, improving innovation effectiveness. Research in this area also shows that involving suppliers in innovation-supported businesses fills the gap by providing crucial technical expertise (Menguc et al., 2014). Supplier involvement as a co-creator can facilitate the evaluation of pertinent knowledge of sustainability from suppliers, which can benefit a diversified and highly sustainable participant. Early, diverse participants may be unable to create new items or incorporate new technology into old ones because of their generally constrained R&D spending (Zhang & White, 2016). According to co-creation research, businesses collaborating with suppliers to develop new goods can combine the necessary technological resources from suppliers with better or more advanced technology (Menguc et al., 2014). The involvement of suppliers in new products is due to this reason. Co-creators can assist participants in developing new goods. It is versatile and possesses the required R&D expertise. to create novel products (Cheng, 2020). Figure 1 also illustrates how our hypotheses integrate into the conceptual model. The researcher can develop a research hypothesis for hypotheses 1 through 8 in the following manner:

H1: *The technological environment has a significant positive influence on supplier involvement as a co-creator for OEM and REM groups.*

H2: *The technological environment has a significant positive influence on supplier involvement as a knowledge source for OEM and REM groups.*

H3: *The social and cultural environment has a significant positive influence on supplier involvement as a co-creator for OEM and REM groups.*

H4: *The social and cultural environment has a significant positive influence on supplier involvement as a knowledge source for OEM and REM groups.*

H5: *The political or legal environment has a significant positive influence on supplier involvement as a co-creator for OEM and REM groups.*

H6: *The political or legal environment has a significant positive influence on supplier involvement as a knowledge source for OEM and REM groups.*

H7: *The management structure and nature have a significant positive influence on supplier involvement as a co-creator for OEM and REM groups.*

H8: *The management structure and nature have a significant positive influence on supplier involvement as a knowledge source for OEM and REM groups.*

In addition, the impact of the business environment on a company's capabilities and the role of suppliers as a source of knowledge and co-creators are significant factors to consider. The business environment is the sum of factors that affect, influence, or determine business operations or performance. The business environment determines what is possible for an organization to achieve. In addition, the business environment is an external force. Factors and institutions beyond the business's control and affecting business organizations' work include customers, competitors, suppliers, government, and social, political, legal, and technological factors. However, companies should avoid any internal issues that impede business expansion. Furthermore, internal audits can scrutinize the enterprise's resources against the strengths and weaknesses of the organization and affirm that the development of products and the formulation of strategies are contingent upon the internal capabilities of the business. Accordingly, the operations of businesses are intricately linked to a complex environment involving the interplay of various activities and networks of both human and material resources. The relationships are instrumental in shaping the internal environment of the enterprise. It is recommended that the organization possess a strong foundation and a proficient and knowledgeable workforce.

However, using the involvement of a supplier as a co-creator may not provide the same level of benefit to the diversified new product candidate. Research and development to transform such technical knowledge can create better products. On the other hand, participants had low R&D capabilities for new products. A highly sustainable approach enables employees to learn continuously in the context of new product innovation. Improve knowledge and skills to develop solutions for new product features, such as non-toxic materials. Energy-saving product design, reusable design, or unique, environmentally friendly production processes (Adams et al., 2016). Thus, it is necessary to involve suppliers of new products. This study examines the contribution of suppliers as knowledge sources and co-creators in enhancing the efficacy of sustainability practices in the context of new product innovations, despite the positive influence of the products on the company's performance. However, certain well-established corporations that embark on novel product ventures may encounter a dearth of knowledge and expertise about new products. Companies' adoption of sustainability practices is associated with their pursuit of superior sustainability practices. Figure 1 also illustrates how our hypotheses integrate into the conceptual model. The researcher

can develop a research hypothesis for hypotheses 9 through 18 in the following manner:

H9: *Supplier involvement as a co-creator has a significant positive influence on knowledge-processing capabilities for OEM and REM groups.*

H10: *Supplier involvement as a knowledge source has a significant positive influence on knowledge-processing capabilities for OEM and REM groups.*

H11: *Supplier involvement as a co-creator mediates a significant positive influence between the technological environment and knowledge-processing capabilities for OEM and REM groups.*

H12: *Supplier involvement as a knowledge source mediates a significant positive influence between the technological environment and knowledge-processing capabilities for OEM and REM groups.*

H13: *Supplier involvement as a co-creator mediates a significant positive influence between the social and cultural environment and knowledge-processing capabilities for OEM and REM groups.*

H14: *Supplier involvement as a knowledge source mediates a significant positive influence between the social and cultural environment and knowledge-processing capabilities for OEM and REM groups.*

H15: *Supplier involvement as a co-creator mediates a significant positive influence between the political or legal environment and knowledge-processing capabilities for OEM and REM groups.*

H16: *Supplier involvement as a knowledge source mediates a significant positive influence between the political or legal environment and knowledge-processing capabilities for OEM and REM groups.*

H17: *Supplier involvement as a co-creator mediates a significant positive influence between the management structure and knowledge-processing capabilities for OEM and REM groups.*

H18: *Supplier involvement as knowledge mediates a significant positive influence between the management structure and knowledge-processing capabilities for OEM and REM groups.*

RESEARCH METHODOLOGY

Research Design

The main objectives of the research design were twofold: (1) to identify critical characteristics that define different market structure groups within the electric vehicle assembly industry and automotive parts manufacturers in the electric vehicle industry, and (2) to analyse the differences in these groups' models, specifically the variations in the causal relationships between latent variables. The classical multi-group analysis (MGA) was deemed complex and inaccurate (Lamberti, 2021). Therefore, alternative techniques have been proposed to analyse measurement invariance in common factor

models, with research focusing on composite models (Henseler et al., 2016). To begin, it's important to understand the difference between common components and composites before discussing the need to assess the measurement invariance of the composite model while conducting a multi-group analysis. Considering the limitations of existing approaches, an important aspect of confirmatory composite analysis is its statistical power and type II error, not only limited to confirmatory composite analysis. All hypotheses are formulated analogously to the classical exact test (p-value) on Structural Equation Modelling (SEM) and it further incorporates an analysis of the knowledge-processing capabilities theory to assess the relationship between the business environment and how it influences the proposed mediators, leading to improved knowledge-processing capabilities. Another relevant point is the impact of market structure on the electric vehicle parts manufacturing industry, as different groups may respond differently to specific knowledge-processing capabilities practices.

Data Collection and Sample

Following the supply chain structure of the electric vehicle industry, nonprobability sampling is a quota sampling method used in each category of enterprises manufacturing automotive components. According to the Thailand Automotive Institute 2021 data, the population used in this study consists of 2,771 automotive parts manufacturers, categorized according to the supply chain structure of the Thai automotive industry, with details including company names and locations. Data gathered from Tier 1 (OEM) auto parts manufacturers in 312 places, Tier 2 and Tier 3 (REM) auto parts manufacturers in 238 areas of the electric vehicle assembly industry, and automotive parts manufacturers in the electric vehicle industry are divided into two hierarchies. Therefore, a random sampling method was used to collect sample data from 550 manufacturers for analysis. Table 1 presents the respondent's market structure in the electric vehicle assembly and parts manufacturers in the electric vehicle sector, including industry classification and electric vehicle platforms.

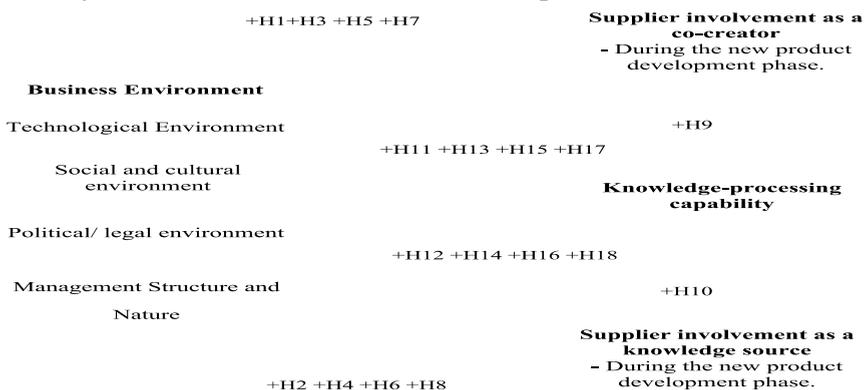


Figure 1: Conceptual Framework on the Market that Parts to supply EVs Assembly Groups of OEM and REM

Table 1: Sample Characteristics

Major Characteristic	Sub-Characteristic	Frequency	%
Gender	Male	399	61.6
	Female	211	38.4
Age	Less than 30 years	30	5.5
	>30-40 years	113	20.5
	>40-50 years	178	32.4
	more than 50 years	229	41.6
Business Model	Sole Proprietorship	38	6.9
	Partnerships	358	65.1
	Limited Company	70	12.7
	Public Limited Company	48	8.7
	Joint Venture	3	.5
	Multinational Corporations: MNCs	33	6.0
Active on Market	Less than 5 years	265	48.2
	5-10 years	238	43.3
	>10-15 years	39	7.1
	more than 15 years	8	1.5
Respondent's Profile	Manufacturing Manager	150	27.3
	Plant Manager	206	37.5
	General Manager	70	12.7
	Vice President of Operations	34	6.2
	Vice President of Sales Marketing	17	3.1
	Managing Director	69	12.5
	Board of Directors	4	.7
Number of Employees	Less than 50 persons	186	33.8
	50-100 persons	233	42.4
	101-150 persons	105	19.1
	151-200 persons	8	1.5
	201-300 persons	13	2.4
	More than 301 peoples	5	.9
Market Structure	OEM	312	56.7
	REM	238	43.3
EV Platforms	Hybrid	191	34.7
	PHEVs	74	13.5
	BEVs	39	7.1
	FCEVs	246	44.7

Measurement Instrument

The study identified seven latent variables representing specific market structures in the automotive assembly industry and electric vehicle parts manufacturing. These variables were considered potential sources of segmentation within the market. The two main markets for automotive parts were the original equipment market (OEM) and the replacement equipment market (REM). The research utilized indicator variables, which were summarized in [Table 2](#) along with the sources of the research instruments. Each indicator was assessed using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

Table 2: Measurement Variables and items for Questionnaire Design

Latent Variables	Items	Scale Source to Adapted
Technological: TL	– Believe software advancements have an impact on business operations.	Yoo et al. (2015); Akpoviroro and Owotutu (2018); Hans (2018)
	– The novel technological factor in EV batteries creates a competitive advantage.	
	– Believe that technology significantly impacts the cost of producing modern products.	
Social and Cultural: SC	– Believe people will soon embrace electric cars.	Akpoviroro and Owotutu (2018); Hans (2018)
	– People are pleased to wait for electricity to be charged at charging points.	
Political/ Legal Environment: PL	– Some regulations and legislation directly impact the organization’s business operations.	Adebayo (2012); Ongeti (2014);(Okeyo, 2014); Akpoviroro and Owotutu (2018); Hans (2018)
	– That revision in government policies may benefit investment promotion.	
Management Structure and Nature: MS	– Having an organizational structure divided into departments can support the production of electric cars (EV).	Hans (2018)
	– Organizational structure factors play a role and can determine your organization’s direction in executing its strategy related to electric vehicles.	
	– Organizational structures in business play a role in directing work and being used in coordination to make decisions quickly to achieve objectives.	
Supplier Involvement as a Co-Creator: SIA	– Our suppliers are actively involved in product design and development activities related to new electric vehicles.	Menguc et al. (2014); Jean et al. (2014); Yenyurt et al. (2014); Cheng (2020)
	– Our suppliers frequently provide feedback and information on new product designs related to electric vehicles.	
	– The involvement of our suppliers is an integral part of the overall electric vehicle-related new product development effort.	
Supplier Involvement as a Knowledge Source: SIK	– Our company uses suppliers as its primary source of knowledge.	Menguc et al. (2014); Jean et al. (2014); Yenyurt et al. (2014); Cheng (2020)
	– Our company actively collects knowledge from our suppliers to develop new electric vehicle products.	
	– Our company actively transfers the knowledge gathered from our suppliers to the product development team related to new electric vehicles.	

Data Analysis

All variables' scale reliability, means, and standard deviations are shown in [Table 3](#). Results show significant connections between factors. All normal distributions validated the sample groups' tests, and normal distribution indices, skewness, and kurtosis scale corroborated gathered responsiveness. Skewness scores should be -3 to 3 for acceptability ([Stuart & Ord, 2010](#)). A large sample of 550 respondents provided the data. Testing validates the principal normal distribution criterion's consistency. Skewness ranged from -.221 to -.660, and kurtosis from -.216 to -.716. Thus, the sample group met the normal distribution principle, indicating that multi collinearity issues are minor in this study. There are no issues despite these relationships. PLS-SEM model guidelines developed common reliability indexes for each latent variable, according to [Ringle et al. \(2020\)](#).

Table 3: Measurement Variables and items for Questionnaire Design (Cont'd)

Latent Variables	Items	Scale Source to Adapted
	– Our company uses the knowledge gathered from our suppliers to determine market trends for new electric vehicle-related products.	
Knowledge-Processing Capabilities: KPC	– Our company actively monitors and implements best practices in our sectors.	Menguc et al. (2014) ; Jean et al. (2014) ; Yeniyurt et al. (2014) ; Cheng (2020)
	– We constantly accumulate economic knowledge regarding our operations and operating environment as a company.	
	– The development activities of our company are based on verified market demands.	
	– Our company devotes considerable time to determining why our projects are successful.	
	– Our organization routinely revises our operating instructions manual.	
	– Our company can seize unexpected opportunities.	
	– Our company can respond quickly to the proactive actions of competitors.	

The results are in [Table 4](#), [Henseler et al. \(2015\)](#) considered group dependability satisfactory if CR, α , and ρA exceeded 0.7. All OEM and REM structures have CRs between 0.747 and 0.906. Both groups' Cronbach's α values were over 0.70, and their ρA values varied from 0.741 to 0.906. These constructions were retained because values were near 0.7 and loadings were higher than 0.7. AVE supported all groups' internal uniformity. All item loadings exceeded 0.7 ([Dijkstra & Henseler, 2015](#)). Since dependability and internal consistency were high, we retained these to maintain build

indicator richness. [Valaei and Jiroudi \(2016\)](#) used Harman's one-factor test to validate CMB. A one-factor principal component factor analysis included all key constructs. Results show that only one factor emerged, explaining 40% of the variance, which, at under 50%, indicated the absence of CMB. We verified all latent variable variance inflation factors (VIFs) were less than 3.3 by performing the whole collinearity test. OEM ranged from 3.192 to 0.906, composite model structures from 1.318 to 2.933, and REM groups from 1.261 to 2.644. Moreover, discriminant validity analysis using the Heterotrait Monotrait Ratio of Correlations (HTMT) should show a low correlation or a common relationship between generating variables and the acceptance criterion value of $HTMT < 1.00$ ([Hair Jr et al., 2021](#); [Lello et al., 2023](#)). [Table 4](#). Descriptive Statistics, Correlations, and Scale Reliabilities for Variables (N=550).

[Table 5](#) considers all acceptance criteria due to the construct relationship in the HTMT lists. The t-test showed all loadings significant. We calculated the Heterotrait-Monotrait (HTMT) ratio of correlations ([Henseler et al., 2015](#)) to assess discriminant validity. Our maximum value, which should be as low as possible, was 0.891, lower than the conservative threshold of 0.900. Furthermore, the results of discriminant validity analysis considered according to the criteria of the Heterotrait-Monotrait Ratio of Correlations (HTMT) used to measure differences should have a low correlation, or the measure of different generating variables should be commonly related to the acceptance criterion value of $HTMT < 1.00$ ([Hair Jr et al., 2021](#); [Thuy, 2022](#)). As a result of the construct relationship in the Heterotrait-Monotrait ratio (HTMT) - lists, all acceptance criteria are considered in [Table 5](#). All loadings were significant according to the t-test. To assess discriminant validity, we calculated the Heterotrait-Monotrait (HTMT) ratio of correlations ([Henseler et al., 2015](#); [Muthuswamy, 2024](#)), which can be interpreted as the correlation between two constructs; its maximum value, which should be as low as possible, was 0.891 in our case, lower than the conservative threshold of 0.900.

RESULTS

Model Analysis Results (Path Coefficients Results)

[Table 6](#) shows the path coefficients, and the t-test statistics calculated for the groups according to the composite model's segmentation variable levels. The most crucial driver for supplier involvement as a knowledge source was the management structure and nature, followed by the political environment / legal environment for the market that parts to supply car assembly: OEM and REM. While the most critical driver for supplier involvement as a co-creator overall was the social and cultural environment, followed by the technological environment and political environment / legal environment for the market that parts to supply car assembly OEM and REM.

Table 4: Descriptive Statistics

Variable	α	M	SD	Skewness	Kurtosis	KPC	Management Structure and Nature	Political and Legal Env.	SIA	SIK	Social and cultural	Technological
KPC	0.888	0.000	1.000	-0.618	0.608	1.000	0.583	0.536	0.732	0.696	0.571	0.689
Management Structure and Nature	0.836	0.000	1.000	-0.221	-0.716	0.583	1.000	0.420	0.554	0.716	0.452	0.493
Political and Legal Env.	0.882	0.000	1.000	-0.660	-0.332	0.536	0.420	1.000	0.455	0.648	0.327	0.377
SIA	0.833	0.000	1.000	-0.461	-0.216	0.732	0.554	0.455	1.000	0.681	0.669	0.657
SIK	0.870	0.000	1.000	-0.401	-0.359	0.696	0.716	0.648	0.681	1.000	0.477	0.515
Social and Cultural	0.842	0.000	1.000	-0.303	-0.690	0.571	0.452	0.327	0.669	0.477	1.000	0.727
Technological	0.741	0.000	1.000	-0.325	-0.515	0.689	0.493	0.377	0.657	0.515	0.727	1.000

Note, α : Cronbach's Alpha, M: means, SD: Standard Deviations

Table 5: Quality Criteria Results: Reliability and Convergent Validity

Items		OEM		REM		Complete			
	α	CR	AVE	α	CR	AVE	α	CR	AVE
KPC	0.848	0.856	0.523	0.888	0.892	0.599	0.867	0.872	0.555
Management Structure and Nature	0.869	0.873	0.792	0.836	0.838	0.753	0.855	0.857	0.775
Political and Legal Env.	0.906	0.906	0.914	0.882	0.882	0.894	0.896	0.896	0.906
SIA	0.844	0.844	0.762	0.833	0.834	0.750	0.839	0.839	0.756
SIK	0.834	0.839	0.669	0.870	0.870	0.719		0.852	0.690
Social and cultural	0.867	0.868	0.882	0.842	0.846	0.863	0.856	0.858	0.874
Technological	0.762	0.765	0.677	0.741	0.747	0.657	0.753	0.757	0.668

Note α : Cronbach's Alpha, CR: Composite reliability (ρ_a), AVE: Average Variance Extracted

At the same time, the insignificant driver for supplier involvement as a knowledge source was social and cultural of the market that parts to supply car assembly OEM. Followed by the driver for supplier involvement as a knowledge source was the technological environment for the market that parts to supply car assembly REM. While the most crucial driver for supplier involvement as a knowledge source overall was the management structure and nature of the market that parts to supply car assembly OEM and REM. Finally, supplier involvement as a co-creator (SIA), Supplier involvement as a knowledge source (SIK), was significant for the Knowledge-processing capabilities (KPC) in all groups; nonetheless, although differences could be observed between both groups, we needed to verify whether those differences were statistically significant, which was done using multi-group analysis (MGA).

Table 6: Quality Criteria Results: Discriminant Validity Analysis (HTML Criteria)

Heterotrait-Monotrait ratio (HTMT) - List	OEM	REM	Complete
Management Structure and Nature <-> KPC	0.606	0.758	0.672
Political and Legal Env. <-> KPC	0.599	0.623	0.607
Political and Legal Env. <-> Management Structure and Nature	0.413	0.575	0.478
SIA <-> KPC	0.832	0.864	0.845
SIA <-> Management Structure and Nature	0.518	0.837	0.652
SIA <-> Political and Legal Env.	0.514	0.533	0.521
SIK <-> KPC	0.796	0.813	0.803
SIK <-> Management Structure and Nature	0.803	0.894	0.841
SIK <-> Political and Legal Env.	0.725	0.760	0.737
SIK <-> SIA	0.748	0.865	0.801
Social and cultural <-> KPC	0.650	0.671	0.658
Social and cultural <-> Management Structure and Nature	0.441	0.652	0.528
Social and cultural <-> Political and Legal Env.	0.378	0.367	0.373
Social and cultural <-> SIA	0.782	0.790	0.786
Social and cultural <-> SIK	0.516	0.610	0.558
Technological <-> KPC	0.839	0.864	0.849
Technological <-> Management Structure and Nature	0.554	0.690	0.610
Technological <-> Political and Legal Env.	0.458	0.462	0.461
Technological <-> SIA	0.826	0.804	0.815
Technological <-> SIK	0.629	0.656	0.639
Technological <-> Social and Cultural	0.886	0.891	0.887

Next, the proposed hypotheses are tested. The structural model results are reported in [Table 7](#) and [Figure 2](#). The H:1, H:2, H:3, H:4, H:5, H:6, H:7, and H:8 indicate the most crucial driver. In addition, the path coefficient is H9 and H10. All path coefficients were significant according to the t-test. Concerning the model's predictability, in line with [Ringle et al. \(2020\)](#), we calculated R2 and the Stone-Geisser test of predictive relevance

(Q2), obtaining R2 values of 0.580, 0.673, and 0.608. in addition, Q2 values of 0.430, 0.0459, and 0.328 for supplier involvement as a co-creator, supplier involvement as a knowledge source, and knowledge-processing capabilities.

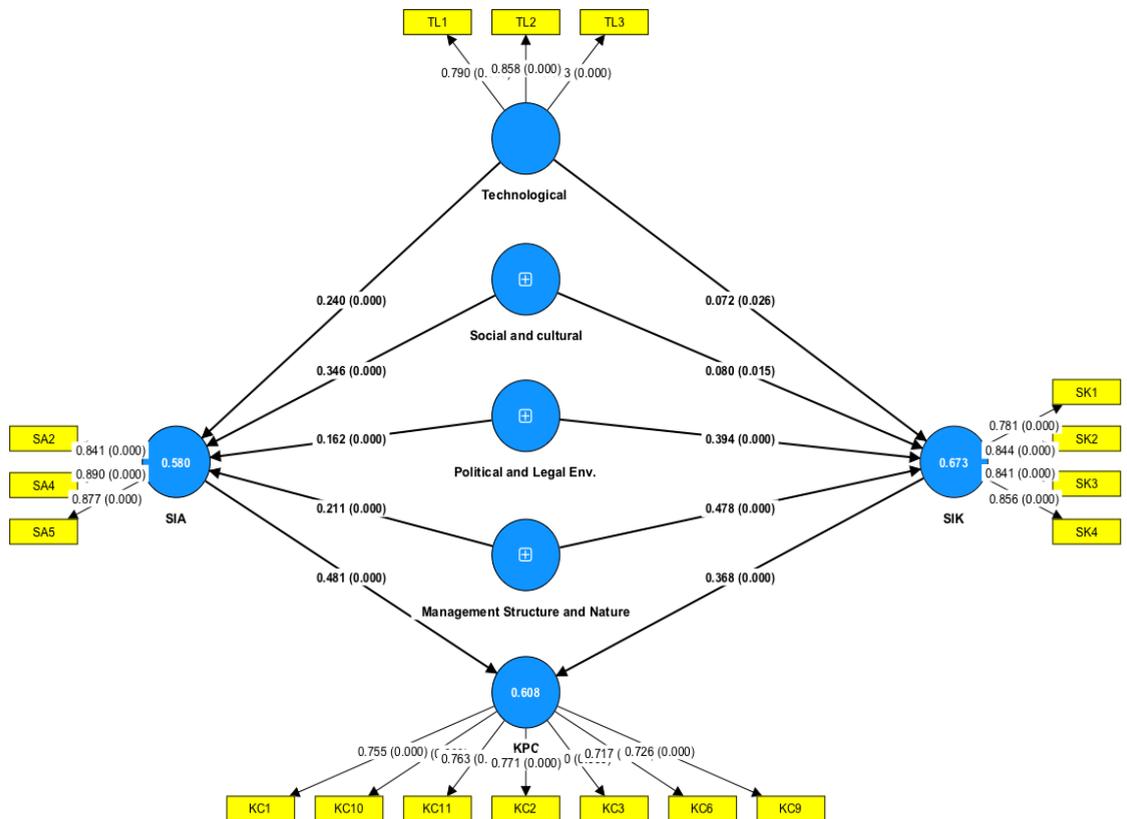


Figure-2. Structural Model Results of Conceptual Framework (Complete Model)

Model Analysis Results (Mediation Analysis and Total Effects Results)

Consequently, the results (Table 7) revealed that all hypotheses were supported in the complete group sample (composite model). However, the results for each market structures context in the automotive assembly industry and automotive parts manufacturers in the Electric Vehicles industry of the sample are essentially consistent with those for the entire sample groups, except social and cultural → SIK ($\beta = 0.055$, $t = 1.142$, $p = 0.127$) was found insignificant in the sample group from OEM. Meanwhile, technological → SIK ($\beta = 0.047$, $t = 0.847$, $p = 0.199$) was found insignificant in the sample from the REM group. The results of the complete group sample (Complete

model) revealed a significant mediating role of H11, H12, H13, H14, H15, H16: H17, H18. Therefore, hypotheses H11-H18 were supported. Furthermore, in the original Equipment Market (OEM) sample group, the analysis showed a significant mediating role of H11, H12, H13, H15, H16, H17, and H18. Nevertheless, social and cultural -> SIK -> KPC (H14: $\beta = 0.021$, $t = 1.149$, $p = 0.125$) were insignificant. Hence, H11-H18 were accepted, except H14 was rejected. In addition, in the Replacement Equipment Market (REM) context sample group, the analysis showed a significant mediating role of H11, H12, H13, H14, H15, H16, H17 and H18. However, Technological -> SIK -> KPC (H12: $\beta = 0.017$, $t = 0.807$, $p = 0.210$), and Social and cultural -> SIK -> KPC (H14: $\beta = 0.035$, $t = 1.633$, $p = 0.051$), was insignificant. Hence, H11- H18 were accepted, while H12 and H14 were rejected.

Multi Group comparisons of Path Coefficients: Measurement Invariance Test Results

The MICOM method assesses compositional invariance by computing latent score correlations between groups and comparing them to the correlation distribution of reference produced from the permutation of the two groups. If the correlation is in the upper tail of the distribution, it is statistically significant at 0.05. The composite invariance of the specific construct was established by accepting the null hypothesis that the theoretical correlation is one (1). The complete measurement invariance requirement allows data from disparate groups to be combined if the constructs have identical mean values and variances ([Affandi et al., 2023](#); [Gappassova et al., 2022](#); [Lamberti, 2021](#)).

The findings from the MICON procedures of steps 2 and 3 are displayed in [Tables 8](#) and [Table 9](#) correspondingly. The tables show the correlations observed at the lowest 5% quantile of the reference distribution. Additionally, they provide the mean differences between the compared groups and the log ratio of variances for each group. These measures' corresponding 95% confidence intervals were obtained using group permutation.

Table 7: Model Analysis Results (Path Coefficients Results)

Items	OEM			REM			Complete		
	β -Value	STDEV	P-Values	β -Value	STDEV	P-Values	β -Value	STDEV	P-Values
Technological -> SIA	0.284	0.060	0.000***	0.185	0.061	0.001***	0.240	0.043	0.000***
Technological -> SIK	0.098	0.051	0.027***	0.047	0.056	0.199	0.072	0.037	0.026*
Social and Cultural -> SIA	0.361	0.056	0.000***	0.282	0.058	0.000***	0.346	0.040	0.000***
Social and Cultural -> SIK	0.055	0.048	0.127	0.098	0.057	0.044*	0.080	0.037	0.015*
Political and Legal Env. -> SIA	0.182	0.050	0.000***	0.108	0.052	0.019*	0.162	0.036	0.000***
Political and Legal Env. -> SIK	0.413	0.041	0.000***	0.371	0.040	0.000***	0.394	0.029	0.000***
Management Structure and Nature -> SIA	0.111	0.049	0.012*	0.393	0.065	0.000***	0.211	0.042	0.000***
Management Structure and Nature -> SIK	0.460	0.039	0.000***	0.501	0.047	0.000***	0.478	0.030	0.000***
SIA -> KPC	0.476	0.049	0.000***	0.489	0.061	0.000***	0.481	0.038	0.000***
SIK -> KPC	0.375	0.052	0.000***	0.358	0.061	0.000***	0.368	0.039	0.000***
	R ²		Q ²	R ²		Q ²	R ²		Q ²
SIA	0.564		0.417	0.633		0.453	0.580		0.430
SIK	0.650		0.428	0.706		0.495	0.673		0.459
KPC	0.595		0.301	0.626		0.364	0.608		0.328

Note: *** $P \leq 0.001$, ** $P \leq 0.01$, * $P \leq 0.05$

Table 8: Model Analysis Results (Mediation Analysis and Total Effects Results)

Items	OEM			REM			Complete		
	β -Value	STDEV	P-Values	β -Value	STDEV	P-Values	β -Value	STDEV	P-Values
Total Indirect Effects Results									
Technological -> KPC	0.172	0.042	0.000***	0.107	0.044	0.007**	0.142	0.030	0.000***
Social and Cultural -> KPC	0.193	0.041	0.000***	0.173	0.041	0.000***	0.196	0.029	0.000***
Political and Legal Env. -> KPC	0.242	0.036	0.000***	0.186	0.036	0.000***	0.223	0.027	0.000***
Management Structure and Nature -> KPC	0.225	0.035	0.000***	0.371	0.043	0.000***	0.278	0.028	0.000***
Specific Indirect Effects Results									
Technological -> SIA -> KPC	0.135	0.034	0.000***	0.090	0.036	0.005**	0.115	0.025	0.000***
Technological -> SIK -> KPC	0.037	0.021	0.040***	0.017	0.021	0.210	0.026	0.034	0.034***
Social and Cultural -> SIA -> KPC	0.172	0.031	0.000***	0.138	0.033	0.000***	0.166	0.022	0.000***
Social and Cultural -> SIK -> KPC	0.021	0.018	0.125	0.035	0.021	0.051	0.029	0.014	0.015***
Political and Legal Env. -> SIA -> KPC	0.087	0.025	0.000***	0.053	0.027	0.026*	0.078	0.018	0.000***
Political and Legal Env. -> SIK -> KPC	0.155	0.027	0.000***	0.133	0.028	0.000***	0.145	0.020	0.000***
Management Structure and Nature -> SIA -> KPC	0.053	0.024	0.015*	0.192	0.034	0.000***	0.102	0.022	0.000***
Management Structure and Nature -> SIK -> KPC	0.173	0.028	0.000***	0.179	0.033	0.000***	0.176	0.021	0.000***

Note: *** $P \leq 0.001$, ** $P \leq 0.01$, * $P \leq 0.05$

Table 9: Model Analysis Results (Mediation Analysis and Total Effects Results) Cont'd

Items	OEM			REM			Complete		
	β-Value	STDEV	P-Values	β-Value	STDEV	P-Values	β-Value	STDEV	P-Values
Total Effects Results									
Technological -> KPC	0.142	0.030	0.000***	0.107	0.044	0.007**	0.142	0.030	0.000***
Technological -> SIA	0.240	0.043	0.000***	0.185	0.061	0.001***	0.240	0.043	0.000***
Technological -> SIK	0.072	0.037	0.026*	0.047	0.056	0.199	0.072	0.037	0.026*
Social and Cultural -> KPC	0.193	0.041	0.000***	0.173	0.041	0.000***	0.196	0.029	0.000***
Social and Cultural -> SIA	0.361	0.056	0.000***	0.282	0.058	0.000**	0.346	0.040	0.000***
Social and Cultural -> SIK	0.055	0.048	0.127	0.098	0.057	0.044*	0.080	0.037	0.015*
Political and Legal Env. -> KPC	0.242	0.036	0.000***	0.186	0.036	0.000***	0.223	0.027	0.000***
Political and Legal Env. -> SIA	0.182	0.050	0.000***	0.108	0.052	0.019*	0.162	0.036	0.000***
Political and Legal Env. -> SIK	0.413	0.041	0.000***	0.371	0.040	0.000***	0.394	0.029	0.000***
Management Structure and Nature -> KPC	0.225	0.035	0.000***	0.371	0.043	0.000***	0.278	0.028	0.000***
Management Structure and Nature -> SIA	0.111	0.049	0.012*	0.393	0.065	0.000***	0.211	0.042	0.000***
Management Structure and Nature -> SIK	0.460	0.039	0.000***	0.501	0.047	0.000***	0.478	0.030	0.000***
SIA -> KPC	0.476	0.049	0.000***	0.489	0.061	0.000***	0.481	0.038	0.000***
SIK -> KPC	0.375	0.052	0.000***	0.358	0.061	0.000***	0.368	0.039	0.000***

Note: *** $P \leq 0.001$, ** $P \leq 0.01$, * $P \leq 0.05$

Concerning the diversity of composite scores among different segments, it was observed that the inter-group variation often exhibited similar levels. Given that our findings have validated partial measurement invariance; we can proceed with MGA are displayed in [Tables 10](#).

Table 10: The Measurement Invariance of Composite Models (MICOM), Step 2: Compositional Invariance Results

Compositional invariance					
Construct	Group: Multi Group	Score Correlation, C value (=1)	5% Quantile	Permutation p Value	Compositional Invariance?
KPC	REM & OEM	0.999	0.998	0.431	Yes
Management Structure and Nature	REM & OEM	1.000	0.999	0.350	Yes
Political and Legal Env.	REM & OEM	1.000	1.000	0.993	Yes
SIA	REM & OEM	1.000	1.000	0.832	Yes
SIK	REM & OEM	1.000	0.999	0.231	Yes
Social and Cultural	REM & OEM	1.000	1.000	0.621	Yes
Technological	REM & OEM	1.000	0.997	0.643	Yes

Note: If the correlation coefficient (c) deviates significantly from a value of one (1), it is necessary to reject the hypothesis and infer the absence of compositional invariance. In contrast, if compositional invariance is upheld, it can be assumed that the composite has been established in a same manner across all groups.

Table 11: The Measurement Invariance of Composite Models (MICOM) Step 3: Equality of Composite Mean Values and Variances Results

Composite Constructs	Equality of Composite Values			
	Mean Values			
	Difference of the Composite's Mean Value (=0)	2.5% - 97.5%	Permutation p - Value	Equal Mean Values?
KPC	-0.017	-0.166 – 0.182	0.843	Yes
Management Structure and Nature	-0.017	-0.171 – 0.168	0.861	Yes
Political and Legal Env.	0.083	-0.179 – 0.177	0.324	Yes
SIA	-0.030	-0.176 – 0.169	0.747	Yes
SIK	-0.046	-0.170 – 0.168	0.601	Yes
Social and Cultural	-0.031	-0.165 – 0.170	0.742	Yes
Technological	0.053	-0.167 – 0.168	0.543	Yes

Composite Constructs	Equality of Composite Values			
	Variance Values			
	Logarithm of the Composite's Variances Ratio (= 0)	2.5% - 97.5%	Permutation p Value	Equal Mean Values?
KPC	0.198	-0.266 – 0.266	0.167	Yes
Management Structure and Nature	-0.065	-0.183 – 0.202	0.522	Yes
Political and Legal Env.	-0.121	-0.237 – 0.221	0.280	Yes
SIA	-0.010	-0.230 – 0.228	0.928	Yes
SIK	0.072	-0.221 - 0.211	0.529	Yes
Social and Cultural	-0.053	-0.193 – 0.194	0.585	Yes
Technological	0.039	-0.202 – 0.199	0.699	Yes

Full measurement invariance implies that both differences equal zero or are at least non-significant (Lamberti, 2021). The results of MICON step 3 are presented in Table 11.

Multi-Group Analysis: Parametric Test Result

In all results from Table 12, we found only that management structure and nature impact supplier involvement as a co-creator was significantly more critical for REM than for OEM (Difference β (OEM-REM) = - 0.282, $t = 3.533$, and $p = 0.000$), and, finally, that management structure and nature mediate the relationship between supplier involvement as a co-creator and knowledge-processing capabilities were more critical for REM than for OEM (Difference β (OEM-REM) = - 0.139, $t = 3.446$, and $p = 0.000$), respectively.

Table-12. Multi-Group Analysis: Parametric Test Results

Items	Difference (OEM - REM)	t Value (OEM vs REM)	p Value (OEM vs REM)
Management Structure and Nature -> SIA	-0.282	3.533	0.000***
Management Structure and Nature -> SIK	-0.041	0.672	0.251
Political and Legal Env. -> SIA	0.074	1.024	0.153
Political and Legal Env. -> SIK	0.042	0.727	0.234
SIA -> KPC	-0.012	0.158	0.437
SIK -> KPC	0.018	0.221	0.413
Social and Cultural -> SIA	0.079	0.962	0.168
Social and Cultural -> SIK	-0.043	0.572	0.284
Technological -> SIA	0.099	1.134	0.129

Technological -> SIK	0.051	0.672	0.251
Political and Legal Env. -> SIK -> KPC	0.022	0.575	0.283
Management Structure and Nature -> SIA -> KPC	-0.139	3.446	0.000***
Political and Legal Env. -> SIA -> KPC	0.034	0.926	0.177
Management Structure and Nature -> SIK -> KPC	-0.006	0.152	0.440
Technological -> SIA -> KPC	0.045	0.896	0.185
Social and Cultural -> SIK -> KPC	-0.014	0.513	0.304
Social and Cultural -> SIA -> KPC	0.034	0.752	0.226
Technological -> SIK -> KPC	0.020	0.662	0.254

Note: ***The Differences are significant in the relationships between market structures context in the automotive assembly industry and automotive parts manufacturers in the Electric Vehicles industry as OEM and REM ($P \leq 0.001$).

DISCUSSION

This study worked to clarify the mediating role of supplier involvement as a co-creator and source of knowledge, which enhanced the knowledge-processing capabilities. The study revealed that the primary factors driving supplier involvement as a source of knowledge were management structure and nature. This was followed by the political and legal environment for the market for supplying parts for electric vehicle assembly, for both OEM and REM groups. Additionally, the most important factors driving supplier involvement as a co-creator were the social and cultural environment, followed by the technological, political, and legal environment for the market for parts to supply the electric vehicle assembly for both OEM and REM groups. Besides, the most crucial driver for supplier involvement as a knowledge source overall was the management structure and nature of the market for parts to supply the electric vehicle assembly for both OEM and REM groups. Finally, the direct effect of supplier involvement as a co-creator and supplier involvement as a knowledge source was significant for the knowledge-processing capabilities in all groups. This result agreed with [Menguc et al. \(2014\)](#); [Yeniurt et al. \(2014\)](#); [Isaksson et al. \(2016\)](#); [Zhang and White \(2016\)](#). However, it was found that the social and cultural nature of the market had an insignificant impact on the involvement of suppliers as a source of knowledge in supplying parts for electric vehicle assembly for OEM groups. Similarly, the influence of supplier involvement as a knowledge source was not significant in the technological environment of the market for parts supplying electric vehicle assembly for the REM group. The mediation analysis results for the OEM group context indicate several significant findings.

The analysis revealed that supplier involvement plays a significant mediating role between various factors and knowledge-processing capabilities. As a knowledge source, supplier involvement has a significant positive influence in mediating the relationship

between the technological environment and knowledge-processing capabilities. Similarly, a significant positive influence was found in the mediation between the management structure and knowledge-processing capabilities. Additionally, supplier involvement as a co-creator was shown to have a significant positive influence in mediating the relationships between the technological environment, social and cultural environment, political or legal environment, and knowledge-processing capabilities. This result agreed with [Menguc et al. \(2014\)](#); [Yeniyurt et al. \(2014\)](#); [Adams et al. \(2016\)](#). However, the influence of supplier involvement as a knowledge source on the relationship between the social and cultural environment and knowledge-processing capabilities was found to be insignificant in the OEM group context. The results of mediation analysis for the REM group context indicate that supplier involvement plays a significant role in mediating the influence between various factors and knowledge-processing capabilities. Firstly, supplier involvement as a co-creator was found to have a significantly positive relationship between management structure and knowledge-processing capabilities. Similar results for the technological environment and knowledge-processing capabilities.

Additionally, supplier involvement as a knowledge source was found to have a significant positive relationship between the technological environment and knowledge-processing capabilities. Moreover, supplier involvement as a co-creator was observed to mediate a significant positive influence between the social and cultural environment and knowledge-processing capabilities, as well as between the political or legal environment and knowledge-processing capabilities. This result agreed with [Gupta et al. \(2013\)](#); [Oginni and Adesanya \(2013\)](#); [Menguc et al. \(2014\)](#); [Yeniyurt et al. \(2014\)](#); [Adams et al. \(2016\)](#). In the REM group, there was no significant influence of supplier involvement as a knowledge source between the technological environment and knowledge-processing capabilities. Similarly, there was no significant influence of supplier involvement as a knowledge source between the social and cultural environment and knowledge-processing capabilities in the REM group context. In the MICON approach, our findings confirm partial measurement invariance. After conducting MGA, we concluded that the management structure and the nature influencing supplier involvement as a co-creator were significantly more critical for REM than for OEM groups. Additionally, we found that the management structure and nature mediating the relationship between supplier involvement as a co-creator and knowledge-processing capabilities were more critical for REM than OEM groups. The complete measurement invariance condition allows us to combine data from different groups, as long as the constructs have the same mean values and variances across the groups. This result is consistent with ([Hair Jr et al., 2021](#)); [Lamberti \(2021\)](#); [Sharma et al. \(2022\)](#).

CONCLUSION

The studies validate important data for a comparative examination of market segments for manufacturers of parts for electric vehicles, especially EV manufacturers. REM is much more dependent on the nature and structure of the management OEM when it comes to supplier involvement as a co-creator, according to research on the knowledge-processing capabilities of businesses. Furthermore, MICOM analysis eliminates the limitations of composite multi-group models. The findings examined how OEM and REM groups influence perceptions of market structures in the electric vehicle assembly industry and parts manufacturers in the electric vehicle industry. It aimed to identify the key factors affecting supplier involvement and firm capabilities related to knowledge processing in various business environment constructs, including technological, social, cultural, political, and legal environments, as well as management structure and nature. The electric vehicle assembly and parts manufacturing industries have identified two distinct market structures and contexts: OEM and REM groups. These groups have different management structures, impacting supplier involvement differently. REM conditions are observed to be more favourable than those of OEM groups. Therefore, we concluded that the management structure and nature influencing supplier involvement as a co-creator have greater significance for REM than for OEM groups. Additionally, we found that the management structure and nature playing a role in mediating the relationship between supplier involvement as a co-creator and knowledge-processing capabilities were more critical for REM than for OEM groups.

IMPLICATIONS

The study's findings have important implications for the electric vehicle assembly and parts manufacturing industries, seeking to enhance their knowledge-processing capabilities and practices in distinct areas. Firstly, the implications highlight the significance of knowledge-processing capabilities and the role of supplier involvement in the context of market structures for the electric vehicle assembly industry and parts manufacturers in OEM and REM groups. It discusses how integration establishes and develops targeted policies and practices related to knowledge-processing capabilities. Secondly, this study suggests that intervening variables can enhance the relationship between supplier involvement and knowledge-processing capability. The research findings indicate that the management structure and nature play a key role in driving supplier involvement as a knowledge source, followed by the political and legal environment for both OEM and REM. Additionally, the social and cultural environment is identified as the most significant factor driving supplier involvement as a co-creator, followed by the technological environment and the political and legal environment for supplying parts to car assembly, for both OEM and REM groups. The electric vehicle

assembly industry and parts manufacturers need to develop specific policies and practices based on a comparison of two different market structures within the automotive industry: the assembly and electric vehicle parts manufacturing sectors. The focus should be on knowledge-processing capabilities. The findings indicate that the impact of management structure and nature on supplier involvement as a co-creator is significantly more important for REM than the OEM group. It should be understood that supplier involvement as a co-creator mediates the relationship between management structure and nature. Additionally, knowledge-processing capabilities were found to be more crucial for REM compared to OEM.

LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

The study has some limitations. The current research only assessed the business environment constructs (technological, social, cultural, political environment, legal environment, management structure, and nature) and their outcomes in the automotive assembly industry and automotive parts manufacturers in the electric vehicle industry (OEM and REM) in Thailand.

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