

Transforming Manufacturing Service Quality through Enhanced Innovation Capabilities

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Abstract

This study investigates the influence of innovation capability and work productivity on service quality in the manufacturing sector. Data were collected through questionnaires distributed to 115 employees in Tangerang, Indonesia, and analyzed using the Structural Equation Modeling (SEM) technique with SmartPLS 3.0 software. The findings reveal that innovation capability and work productivity significantly and positively impact workers' service quality to customers. Additionally, innovation capability has a notable positive effect on work productivity. This research also demonstrates the validity of the measurement instruments used, despite their relatively low number of items. Theoretically, the study contributes to the dynamic capabilities theory by affirming the role of innovation capability as a strategic asset for improving organizational performance. Practically, the research offers actionable insights for enhancing service quality through targeted innovation-focused training and a culture of creativity among employees. From a managerial perspective, the study emphasizes the importance of embedding innovation within operational processes and aligning productivity strategies with quality control measures to meet customer expectations and sustain competitive advantage. The results underscore the importance of continuous innovation and productivity enhancement as critical factors in achieving service excellence, especially in the era of Industry 4.0. Future research is recommended to expand the scope to other sectors and include additional variables to provide a more comprehensive understanding of these relationships.

Keywords:

Innovation capability, work productivity, service quality, manufacturing, Industry 4.0.



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INTRODUCTION

Initially, information and communication technology had limited capabilities in meeting daily needs, but it has now become an integral part of everyday life. Accessing information was once restricted to printed media, such as magazines and newspapers. However, over time, information can now be readily obtained through electronic media, particularly the internet. The advancement of the manufacturing industry has accelerated due to the technological revolution, leading to the emergence of the industrial revolution 4.0 (Asbari, Wijayanti, et al., 2020). This new era necessitates that manufacturing organizations prioritize innovation and work productivity as foundational elements for enhancing service quality to customers. Additionally, industrial revolution 4.0 has raised customer expectations significantly (Agistiawati et al., 2020; Asbari, Purwanto, et al., 2020; Basuki et al., 2020; Fikri et al., 2020; Hutagalung et al., 2020; Novitasari, Kumoro, et al., 2020; Novitasari, Yuwono, et al., 2020; Putra et al., 2020; Waruwu et al., 2020).

Consequently, it is crucial for the manufacturing sector to consistently foster internal technological innovations that are unique and not easily replicated by competitors. These innovations should be both efficient and effective, meaning they can be simple and cost-effective while still providing significant value. The enhancement of workers' innovation capabilities within the company is essential for achieving this (Goestjahjanti et al., 2020; Silitonga et al., 2020; Sudiyono et al., 2020; Sutardi et al., 2020; Yuwono et al., 2020). Companies with strong innovation capabilities are better equipped to adapt to their environments and develop new skills that support ongoing excellence (Rajapathirana & Hui, 2018a). Furthermore, innovation can serve as a means to secure a sustained competitive advantage (Bharadwaj et al., 1993). The ability to innovate is often protected by the complexity of unique assets, which helps safeguard against imitation and enhances product value (Teece, 1981). Bharadwaj et al. (1993) also noted that the complexity of special assets indirectly contributes to sustained competitive advantage through innovation, particularly technological innovation (Fikri et al., 2024; Napitupulu et al., 2024; Novitasari, 2024; Radita et al., 2024).

In practice, companies that successfully compete and sustain their operations implement quality programs to effectively eliminate low-quality products (Asbari, 2024; Iskandar et al., 2024; Widodo et al., 2024). Quality control activities aim to minimize the occurrence of subpar products, ensure that finished goods meet the company's quality standards, and prevent low-quality items from reaching customers. To uphold product quality, companies must engage in rigorous and ongoing monitoring and supervision of material quality, production processes, and final products. Quality control (QC) programs are essential, starting from the raw materials through to the production process (Asbari et al., 2019; Ong et al., 2020; Purwanto, Asbari, et al., 2019a, 2019b; Purwanto, Asbari, Ong, et al., 2020; Purwanto, Asbari, Santoso, et al., 2020; Purwanto, Budi Santoso, et al., 2020; Purwanto, Mayesti Wijayanti, et al., 2019; Purwanto, Putri, et al., 2020).

The goal of quality control is to maintain and continuously enhance work productivity for both employees and the organization (Asbari et al., 2024; Febriyani et al., 2024). The key question remains: to what extent do innovation capability and work productivity influence the quality of service provided by workers to customers? These two factors—innovation capability and work productivity—are vital components for enhancing the ongoing competitiveness of manufacturing industries. While numerous studies have explored the relationship between innovation capability and work productivity in relation to service quality, a comprehensive analysis that integrates these two variables into a single model is still lacking. Therefore, addressing this research gap is essential for generating valuable insights that can inform manufacturing industry leaders as they navigate the challenges of the industrial revolution 4.0.

Literature Review and Hypothesis Development

Service Quality

The era of globalization, coupled with rapid advancements in information technology, has significantly impacted economic activities. These swift changes have implications for both domestic and international economies, intensifying competition within various industries. As a result, management is increasingly pressured to adapt to these changes. To sustain growth, companies must enhance their competitive excellence.

Today, quality has emerged as a critical concern in the business landscape, prompting many organizations to focus more on the quality of their products. Quality is a key operational target and responsibility within the industry. In the service sector, companies must prioritize policies that emphasize the importance of quality. Higher service quality directly correlates with increased customer satisfaction.

Service quality refers to the performance delivered by one individual to another, often characterized as an intangible action that does not involve the transfer of ownership of goods (Kotler & Lee, 2008). Essentially, a service is an action performed by the seller to meet the needs and wants of the customer, ultimately aimed at achieving customer satisfaction. This service is realized when customers select products they desire after completing their purchase transactions. High-quality service not only fosters customer loyalty but also enhances profitability for the company. In this research, service quality is evaluated using five dimensions adapted from Parasuraman et al. (1988): (1) accessibility in product ordering, (2) responsiveness to consumer needs, (3) accountability for product quality, (4) ease of returning unsatisfactory products, and (5) availability of products in the market.

Innovation Capability

Anning-Dorson (2016) noted that innovation within service companies can stem from various sources, with these organizations seeking innovative solutions in their operations, influenced by both the market (external environment) and customer feedback. Innovation is defined as the practical application of an idea into a specific product or process, representing a new condition for certain goods, services, or concepts (Mansury & Love, 2008).

Innovation capability is regarded as a vital asset for companies aiming to achieve and sustain competitive excellence while effectively implementing their strategies. This capability is integrated into the core processes of the organization (Lawson & Samson, 2001). The performance of innovation can be understood as a blend of assets and resources, necessitating various types of resources, assets, and skills to thrive in a rapidly evolving environment (Rajapathirana & Hui, 2018a).

According to Rajapathirana & Hui (2017), innovation capability encompasses: (1) the ability to develop new products that meet market needs, (2) the capacity to implement suitable technological processes for producing these new products, (3) the ability to develop and adopt new products and technologies to address future needs, and (4) the capability to respond to both intentional and unforeseen technological activities initiated by competitors. In this research, the definition and dimensions of innovation capability are adapted from Rajapathirana & Hui (2017), which include organizational culture, knowledge, and the involvement of customers and employees.

Work Productivity

In managing projects or overseeing operations and production, there is a significant connection to the concept of productivity. Productivity indicators are inherently linked to both input and output. Inputs refer to the resources utilized, such as capital, labor, materials, and energy, while outputs represent the quantity of products produced or the revenue generated. Productivity is typically measured by the ratio of output to input used in the production process (output per input unit).

Productivity illustrates the relationship between the results (the amount of goods and/or services produced) and the resources (such as labor, capital, land, and energy) required to produce those goods (Greenberg, 1973). Van (2009) described productivity as a straightforward comparison calculated between the number of products and the amount of each resource utilized during the process. These resources can include land, materials, machinery, tools, and labor. Mansury & Love (2008) further defined productivity as the tangible output (product) generated by an individual or group within a specific timeframe and working process. Thus, a higher volume of products produced in a shorter time frame indicates a higher level of work productivity, and vice versa.

Several factors influence productivity within an organization, including technical, production, personnel, financial, management, governmental, and location factors. According to Sinungan (2000), productivity measurement encompasses four main types: first, the quality of work, assessed through accuracy, neatness, work speed, skill, and proficiency; second, work quantity, evaluated by the ability to meet targets or achieve results for new tasks; third, adherence to company standards, which reflects reliability and capability in performing tasks; and fourth, work efficiency, which considers the effective use of time to complete assigned tasks (Greenberg, 1973; Sinungan, 2005).

Measuring work productivity serves as a tool for analyzing and enhancing production efficiency. It also aids in setting targets and serves as a practical standard for employee compensation. Productivity can be assessed using two types of working hours: paid working hours and the actual hours spent working. In this research, the definitions and dimensions of the innovation capability variable are adapted from Greenberg (1973), which include work quality, work quantity, standard fulfillment, and work efficiency.

The Influence of Innovation Capability on Work Productivity

Innovative behavior could bring a large contribution when competing with other companies because the innovative behavior of workers could give new ideas. Chang, Liu (2007) claimed that innovative behavior is something that has a large contribution to improving productivity. According to Kusumawati (2010), successful implementation of creative ideas owned by a company could apply behavior that is innovative for the workers who can improve the productivity of the company. Putri dan Budiastuti (2012) also claimed that innovative behavior has a positive influence on work productivity, where innovative behavior could be enhanced by pushing worker's creativity and innovation behavior. From the idea above, the hypothesis filed in this research is:

H1: Innovation capability has a significant influence on work productivity.

Influence of Innovation Capability on Quality of Service

Innovation capability facilitates the company to implement an appropriate technological process in developing new products that fulfill the market's need and remove competition threats (Rajapathirana & Hui, 2018a). This is helpful to form and to manage kinds of company's skills to support the integration of ability and stimulus to successfully innovate. Excellent innovation capability tends to implement and develop a variety of new products and existing product portfolios (Dadfar et al., 2013). Rajapathirana & Hui (2017) explained that a company should improve their leadership, people, partnership, and organization's capability before implementing the initial innovation process and establishing new products. Some researchers conclude that innovation capability is the capacity of a company to expand new products through a combination of innovation behavior, strategic skills, and internal technological process (Bhat & Momaya, 2020; Vicente et al., 2015). The result of research proved that innovation capability influences the quality of service (Ngo & O'Cass, 2013; Roth & Jackson, 1995). From the idea above, the hypothesis filed in this research is:

H2: Innovation capability has a significant influence on the quality of service.

The Influence of Work Productivity on Quality of Service

Quality of service does not appear by itself. Other than that, customer's satisfaction towards service given to them can be influenced by a few factors, which are worker's and organization's work productivity. The result of research proved that work productivity influences the quality of service (Ngo & O'Cass, 2013; Roth & Jackson, 1995). From the idea above, the hypothesis filed in this research is:

H3: work productivity has a significant influence on the quality of service.

Research Conceptual Framework

According to Sekaran & Bougie (2003), a theoretical framework is a foundation on where the whole research project is based on. From the theoretical framework, the hypothesis could be arranged to determine whether the theory formulated is valid or not. Next, the research could be measured by the appropriate statistical analysis. Referring to theories and previous research, there are relationships found between the influence of variables as follows: innovation capability, work productivity, and quality of service. Therefore, the author has made the research model as shown below:

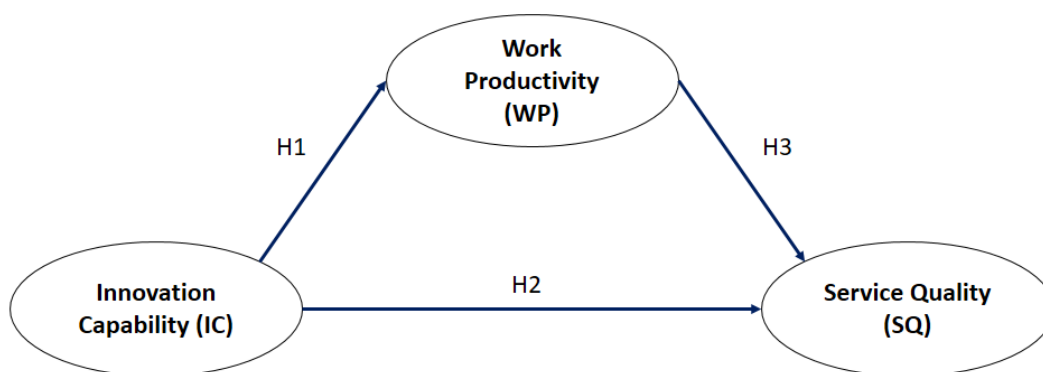


Figure 1. Research Model

METHOD

The method used in this research is the quantitative method. Data collection is done by spreading questionnaires to every worker in the manufacturing industry in Tangerang, Indonesia. Innovation capability is adapted by the research of Rajapathirana & Hui (2018b) By using 3 items. Work productivity is adapted by the research of Greenberg (1973) dan Sinungan (2005) by using 10 items. Meanwhile, quality of service is adapted by the research of Parasuraman et al. (1988) by using 14 items. The questionnaire is closely designed, except for the questions/statements concerning the respondent's

identity, which is a semi-opened questionnaire. Every closed questions/statement, five answer options are given, which consist of: strongly agree (SA) with 5 scores, agree (A) with 4 scores, Neutral (N) with 3 scores, disagree (DA) with 2 scores, and strongly disagree (SDA) with 1 score. The method in data processing is by using PLS and SmartPLS 3.0 software as the tool.

The population in this research is the workers working in the manufacturing industry in Tangerang, Indonesia that consists of 141 workers. A questionnaire is given by a simple random sampling method. The questionnaire that was returned and valid as many as 115 samples (81.56% from the whole population)

RESULTS AND DISCUSSION

Results

Table 1. Descriptive Sample Information

Criteria		Total	%
Age (per September 2018)	≤ 30 years old	24	21%
	31 - 50 years old	85	74%
	≥ 51 years old	6	5%
Working Experience	1 - 5 years	82	71%
	6-10 years	22	19%
	> 10 years	11	10%
Last Education	≤ Secondary high	86	75%
	≥ Bachelor degree	29	25%

Results for Validity Test and Research Indicator Reliability

Stages of measuring on testing model involve convergent validity test and discriminant validity. While the value of Cronbach's alpha and composite reliability is needed in testing for construction reliability. PLS analysis results could be used to test for research hypothesis if all indicators in the PLS model have met the requirements of convergent validity, discriminant validity, and reliability test.

Convergent Validity Test

A convergent validity test is done by seeing the value of the loading factor of each indicator towards the construct. In most references, with factor weighing from at least 0.5 is considered to have validity that is strong enough to explain the latent construct (Chin W, 1998; Flury et al., 1988; Imam Ghozali, 2017). In this research, the minimum limit of loading factor that is accepted is 0.7, with the condition of AVE score for every construct, which is > 0.5 (Imam Ghozali, 2017). Based on the result from SmartPLS 3.0, after taking out the items that did not meet the requirements, all items in Figure 2 and Table 2 having the loading factor value above 0.7 are considered to be valid. Therefore, the convergent validity of this research model can all be seen in Figure 2 and Table 2. So, in this research, items from each of the variables and dimension are considered with notation as follows: items from the innovation capability variable consist of three items, which are IC1-IC3, items from the work productivity variable consist of four items, which are WP1-WP4. Items from the service quality variable consist of five items, which are SQ1-SQ5. The details are shown in Table 2.

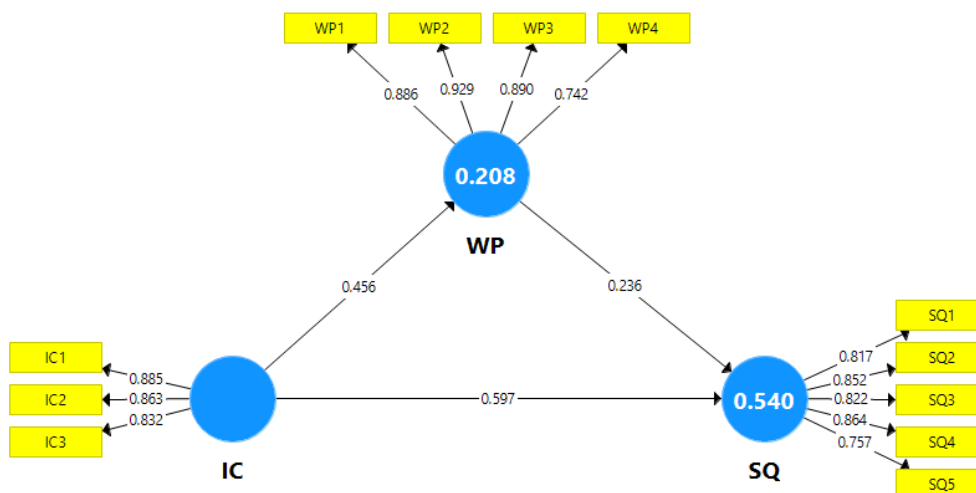


Figure 2. Research Model Fit
Table 2. Validated Items

Var.	Items	Items Description	Loadings	Cronbach's Alpha	Composite Reliability	AVE
Service Quality (SQ)	SQ1	The company gives access to product ordering	0.817	0.881	0.913	0.678
	SQ2	Workers are fast and responsive in responding to consumer's needs	0.852			
	SQ3	The company is responsible for the quality of products	0.822			
	SQ4	Accessibility in returning products that do not satisfy consumer's needs	0.864			
	SQ5	Products are easily found in the market and the sale center is easily contacted by customers	0.757			
Innovation Capability (IC)	IC1	I argue that the company has innovation in the culture of the organization	0.885	0.825	0.895	0.740
	IC2	I argue that a company receives knowledge from different sources	0.863			
	IC3	I argue that a company prioritize worker's and customer's inclusion	0.832			
Work Productivity (WP)	WP1	I have the skill and prowess in work to produce a good quality of goods	0.886	0.885	0.992	0.748
	WP2	I can achieve the project target	0.929			
	WP3	I implement the rules according to the company's standards	0.890			
	WP4	I have the ability in time utilization when working	0.742			

Source: The Table is derived from the output of the SmartPLS 3.0 (authors, 2020)

Discriminant Validity Test

Discriminant validity is done to ensure that every concept of each latent variable is in contrast with the other latent variables. A model has a good discriminant validity if the quadratic value of AVE in each exogenous construct (value on the diagonal) exceeds the correlation between the construct with the other construct (value below diagonal) (Ghozali, 2014). The result of discriminant validity research is done by the quadratic value of AVE, which means by seeing the Fornell-Larcker Criterion Value that is obtained the same way as shown in Table 4. The discriminant validity test result shown in Table 4 below indicates the whole construct having a square root value of AVE above correlation value with

the other latent construct (through Fornell-Larcker Criterion), so it can be concluded that a model has met a discriminant validity.

Moreover, collinearity evaluation is done to discover whether there is collinearity in the model. To find out about collinearity, VIF estimation from every construct is required. If the VIF score is higher than 5, then the model will show collinearity (Hair et al., 2014). It is shown the same way as in Table 5, all VIF score that is less than 5 means that the model has no collinearity.

Construct Reliability Test

Construct reliability can be assessed from the value of Cronbach's alpha and composite reliability from each construct. The value of composite reliability and Cronbach's alpha is suggested to be more than 0.7 (Imam Ghozali, 2017). If the value of composite reliability is above 0.7, then it is sufficient (Imam Ghozali, 2017). Reliability test results in Table 3 above show that all construct has composite reliability value and Cronbach's alpha value higher than 0.7 (> 0.7). In conclusion, all construct has met the reliability that is required.

Hypothesis Examination

The hypothesis test in PLS is also denoted as an inner model test. This test covers a significance test that has a direct and indirect impact as well as how large is the measurement of the exogenous variable impact towards the endogenous variable. The influence test is done by using a t-statistic test in an analysis model called Partial Least Squared (PLS) with the help of SmartPLS 3.0 software. With the bootstrapping technique, R square value and significance test value can be obtained as shown in the table below:

Table 3. Discriminant Validity

Variables	IC	SQ	WP
Innovation Capability (IC)	0.860		
Service Quality (SQ)	0.704	0.823	
Work Productivity (WP)	0.456	0.508	0.865

Table 4. Collinearity Statistics (VIF)

Variables	IC	SQ	WP
Innovation Capability (IC)	-	1.262	1.000
Service Quality (SQ)	-	-	-
Work Productivity (WP)	-	1.262	-

Table 5. R Square Value

	R Square	R Square Adjusted
Service Quality (SQ)	0.540	0.538
Work Productivity (WP)	0.208	0.206

Table 6. Hypotheses Testing

Hypotheses	Relationship	Beta	SE	T Statistics	P-Values	Decision
H1	IC → WP	0.456	0.037	12.444	0.000	Supported
H2	IC → SQ	0.597	0.046	12.882	0.000	Supported
H3	WP → SQ	0.236	0.044	5.396	0.000	Supported

According to Table 5 above, the *R Square* value of SQ is 0.540, which means that the variable of SQ could be explained by the variable of IC and WP in the percentage of 54%, while the remaining 46% is explained by other variables not discussed in this research. *R Square* value of WP is 0.208, this means that the variable of WP could be explained by the variable of IC in the percentage of 20.8%, while the remaining 79.2% is explained by other variables not discussed in this research. Meanwhile, Table 6 shows *t-statistics* and *p-values* that present the influence between variables mentioned above.

The result of analytical data shows that innovation capability has a significant positive influence on work productivity. This is proven by the *t-statistics* value of 12.444, which is larger than 1.96, and *p-values* of 0.000 which is smaller than 0.05. This concludes that H1 is accepted, due to significant influence. Therefore, it can be concluded that innovation capability has a significant positive influence on work productivity. Innovation capability has a significant positive influence on service quality. This is proven by the *t-statistics* value of 12.882, which is larger than 1.96, and *p-values* of 0.000 which is smaller than 0.05. This concludes that H2 is accepted, due to significant influence. Therefore, it can be concluded that innovation capability has a significant positive influence on service quality. Work productivity has a significant positive influence on service quality. This is proven by the *t-statistics* value of 5.396, which is larger than 1.96, and *p-values* of 0.000 which is smaller than 0.05. This concludes that H3 is accepted, due to significant influence. Therefore, it can be concluded that work productivity has a significant positive influence on service quality.

Discussion

Data analysis above concludes that innovation capability and worker's work productivity gives a significant positive influence on the quality of service. Likewise, innovation capability has a significant influence on work productivity. Quality of service is the most crucial part and is a differentiating factor between one company to the other. Excellence in competing for that is felt needs to be continuously developed, so the company could exist in the era of industrial revolution 4.0 that necessitates unique and significant excellence.

Good competing excellence in a business depends on the resource defense and unique skill owned by the company. Position of competing advantage that could survive is the key of long term superiority of business performance. Position of a strong advantage will create values that are highly perceived by the customers and could create relatively low cost and finally, push for the work differentiation achievement, that is supported by oriented skill in a market and company's resource. Competitive advantage is a dynamic process, so it has to be done continuously. Competitive advantage visualizes a certain company that can act better compared with other companies, although they run in the same industry (Hasan, 2008). The better the intellectual capital and innovation capability owned by the workers, the higher the competitive advantage (Jose & Gonzales, 2012). The ability to do innovation is highly significant to create competitive advantage (Larsen & Lewis, 2007), innovative skills could also improve competitive advantage (Parkman et al., 2012).

CONCLUSION AND SUGGESTION

Conclusion

From the data analysis conducted, it is evident that innovation capability and work productivity significantly enhance workers' quality of service to customers. Furthermore, innovation capability has a positive and significant influence on work productivity. Another noteworthy aspect of this study is the validity of the instruments used, despite having a relatively low number of items.

Theoretical Implications

This research contributes to the theoretical understanding of the interplay between innovation capability, work productivity, and service quality. It reinforces the dynamic capabilities theory by illustrating how innovation capability functions as a critical organizational asset to improve productivity and service quality. Additionally, this study provides empirical validation for existing constructs and their interrelationships, serving as a reference for future studies on organizational performance and competitive advantage.

Practical Implications

The findings suggest actionable strategies for organizations aiming to enhance their service quality. By investing in innovation-oriented training programs and fostering a culture of creativity among employees, companies can significantly improve both productivity and service quality. Moreover, the simplicity and validity of the instruments used in this study indicate their applicability in diverse organizational settings, enabling managers to diagnose and address performance gaps effectively.

Managerial Implications

For managerial practitioners, this research highlights the critical role of fostering innovation capabilities within teams to achieve sustainable competitive advantage. Managers should prioritize the integration of innovative practices into daily operations, ensuring that employees are equipped with the necessary resources and support to innovate. Furthermore, implementing robust quality control mechanisms aligned with productivity goals can lead to enhanced customer satisfaction and long-term business success.

Suggestion

It is suggested for future studies to research by using items instrument resulted from CFA analysis for wider utilization, so it can test back the validity and reliability of the instrument. The development and expansion meant are, for example, research in another analytical unit, such as customer and supplier. Likewise, development research in other sectors could be done, such as the educational sector, social, and another public sectors. In the future study, it is suggested to have additional and involve another relevant variable, so it would make the research in the same theme to be more complete and comprehensive.

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