
THE ROLE OF SUPPLY CHAIN CAPABILITY AS MEDIATION BETWEEN DIGITALIZATION AND DIGITAL CONNECTIVITY ON OPERATIONAL PERFORMANCE

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ABSTRACT

The purpose of this study was to identify the factors that influence the operational performance of PT. Kereta Api Indonesia (Persero) or PT.KAI at Head Office in Indonesia using IPMA analysis on SmartPLS. This research develops theoretical aspects of understanding digitalization in Indonesia, which consists of supply chain capability variables mediating between digitalization and digital connectivity. Additionally, the study explores the roles of digital culture and technological turbulence as moderators influencing operational performance. Then, there is digital connectivity that will affect operational performance. This study uses a quantitative method with data sources derived from surveys through the distribution of online questionnaires to 48 Employees in the Logistics Department. The data analysis technique used is SEM-PLS and IPMA Analysis using SmartPLS software. Digitalization exhibits the greatest impact on operational performance in the presence of a mediating variable, which is the supply chain capability of PT. As supported by the IPMA analysis, KAI (Persero) at the Head Office indicates that digitalization holds the highest performance value compared to other variables—the management of PT. KAI must focus on digital culture, supply chain capability, and technological turbulence in conjunction with digitalization. This approach is crucial to ensure the company implements the Rapid Apps and maintains operational performance consistently. The study is the first study conducted to analyze the factors that influence operational performance in PT. KAI, so that it can be a reference and additional reference on academic knowledge and managerial aspects.

Keywords: operational performance, digital culture, supply chain capacity, environmental turbulence, digitalization, digital connectivity.

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INTRODUCTION

The Industry 4.0 revolution has made digital technology a crucial aspect for industries to grow their businesses. This presents opportunities to implement automation systems to enhance productivity efficiency and foster greater innovation (Helmi, 2019). One sector that has witnessed growth due to technology in the Industry 4.0 era is transportation. Technological advancements in transportation can significantly impact effectiveness and efficiency. Transportation advancements in the Southeast Asian region, also known as ASEAN, have influenced shifts in human activities and lifestyles (Putri & Lestari, 2014).

The rapid evolution of transportation technology holds significant implications for company performance. Hence, companies need to interact with information technology to achieve their goals. This interaction enables companies to optimize transportation processes, elevate productivity, and

swiftly respond to market changes, sustaining competitiveness and addressing industry challenges. This is possible due to the integrated information offered by digital technology (Helo et al., 2014).

The train is one of the public transportation that has developed its industry by applying transformation technology to keep abreast of the times; besides that, this transportation is known by the community, so it must follow the lifestyle in the community. According to (Calderwood, Laure-Calderwood, Lauren Uppink, & Soshkin (2019), Globally 2019, Hong Kong is ranked first because of its high-quality transportation infrastructure, especially regarding railways due to its good performance.

A company needs to pay attention to its performance regularly by paying attention to it as a whole so that the company can take the right and strategic actions and decisions for the future. Factors that affect performance are ability, personality and work interest, clarity and acceptance of a worker, level of worker motivation, competence, work facilities, work culture, leadership, and work discipline (Samsung, 2017). One type of performance is operational performance, with a series of internal company activities related to planning, coordinating, activating, and controlling all organizational activities to manage inputs into outputs that provide added value (Huda & Syifaul, 2019).

The company conducts performance appraisals to evaluate the performance results for two years. The results of realizing the Company's Work Plan and Budget (RKAP) decreased by 21.40. However, the company still received a soundness level with an A value. From the data above, the company is healthy in applying funds based on each function within the company despite the decline (Transformasi Digital Supply Chain Pada Proses Bisnis, 2022).

The industry in Indonesia is undergoing a massive digital transformation that requires companies to adapt technology. Many industries face threats that affect their business, driving changes in business models, cultural structures, and organizational skills and competencies (Warner & Wäger, 2019). Therefore, the Ministry of State-Owned Enterprises has developed a Strategic Plan to increase the competitiveness of state-owned companies. In addition, the business environment continues to evolve rapidly as digital transformation becomes a major trend, requiring accelerated service delivery and cost efficiency.

In order to achieve good operational performance, it is important to build strong relationships between various business aspects in each department. The achievement of transportation performance in Indonesia can be seen from the performance of the Ministry of Transportation's budget over the last four years, which has continued to increase. Based on what was reported by the Ministry of Transportation of the Republic of Indonesia, it was found that budget performance in 2019 reached 92%. In 2020, it was 95.59%. In 2021, it was 97.19%, and in 2022, it was 96.96%, indicating that management is improving yearly (Wibowo, 2021). According to the Minister of Transportation, there are three main performance focuses: the development of transportation infrastructure, increasing regional connectivity, and transportation services and safety throughout (Joewono et al., 2016). This causes companies to be required to improve their quality by having competitive advantages and achieving success in the market by improving their performance (Putri & Lestari, 2014).

Digitalization will change how companies interact in the upstream and downstream value chain, increasing data acquisition, warehousing, and data analytics (Porter & Heppelmann, 2014).

This process involves various parties, such as manufacturers, warehouse managers, vendors, carriers, distributors, and retailers. Digitalization drives stronger connectivity in supply chain ecosystems with digital growth (Nadkarni & Prügl, 2021). Digital platforms play an important role in facilitating interactions and transactions between users (Gawer, 2021), as well as having a major impact on supply chain capabilities in procurement, inventory management, and product delivery, such as assisting in terms of collaboration, improving demand forecasting and procurement, and increase efficiency (Yan et al., 2016). As a result, companies are developing digital connectivity to access and share information with supply chain partners (Wong et al., 2011). In addition, there is technological turbulence within the industry, which refers to the level of technological progress in an industry, with short cycles from acceptance to replacement.

Railway transportation innovates business development by utilizing technology systems to make it easier for passengers and employees (Rakhmanberdiev et al., 2022). The application of electronic systems such as e-ticketing, e-boarding, e-kiosk, e-library, e-procurement, e-requirement, and others followed the development of the railroad company. This electronic system's existence can facilitate companies' internal and external mobility, especially train users (Faturrahman & Belgiawan, n.d.).

Focus on digitalization at PT.KAI (Persero) is improving the procurement process from SAP MM users to Financial Users. The use of technology in the infrastructure sector has been going well. However, several problems during system development occurred due to adjustments to applicable policies and laws. Even though the system has been well implemented, the company still needs help in Material Requirement Planning (MRP). The Rapid application helps streamline workflows, but performance evaluation is still in trial and error because it was only implemented in 2021. Digital transformation increases company efficiency and productivity. Companies need to ensure that the system used can be implemented properly (Dody et al., 2023).

The objective of this study is to assess the various factors impacting the process of digitalization within PT.KAI (Persero). This potentially impacts operational efficiency, supply chain capabilities, and fostering a digital culture (Rajala & Hautala-Kankaanpää, 2023). Furthermore, the absence of research delving into the factors influencing digitalization within the transportation industry, particularly concerning operational performance, accentuates the significance of this study's contribution. By adopting an atheoretical approach, this research aims to enrich the field of logistics management with novel reference points. Employing SEM-PLS methodology, this study will delve into the importance of performance matrix analysis (IPMA) to offer precise, targeted managerial insights for PT.KAI (Persero) in terms of digitalization. By identifying the performance and importance through the IPMA analysis, the study aims to provide practical recommendations to facilitate the digitalization process.

Furthermore, there has been limited research on the impact of digital platforms on a company's operational performance through digital culture, supply chain capability, and digital connectivity in Indonesia, particularly in the transportation industry. PT KAI (Indonesian state-owned railway company) has the potential to sustain its operations by establishing a strong operational performance, considering its status as a sole company in the industry. Another positive outcome is driving the growth and sustainability of related business sectors. There is currently no research

addressing the specific factors influencing PT.KAI in the Rollingstock sector from upstream to downstream to achieve good operational performance.

Furthermore, there has been limited research on the impact of digital platforms on a company's operational performance through digital culture, supply chain capability, and digital connectivity in Indonesia, particularly in the transportation industry. Indonesian state-owned railway company has the potential to sustain its operations by establishing a strong operational performance, considering its status as a sole company in the industry. Another positive outcome is driving the growth and sustainability of related business sectors. There is currently no research addressing the specific factors influencing in the Rollingstock sector from upstream to downstream to achieve good operational performance.

Additionally, systems are constantly evolving, and there has been a decline in performance. Therefore, this research contributes by providing recommendations to the company and suggesting areas for further research. Consequently, by modifying the integration of two models concerning digitalization's impact on firm performance and platform-based digital connectivity with a moderated model, it will provide a fresh perspective and contribution to enhancing the digital transformation that can improve the operational performance.

Hypothesis

Technology has the opportunity to connect various forms of software and applications seamlessly (Chen et al., 2014). Companies use this software to control production and logistics, manage data, and support the integration of applications and processes between companies (Helo et al., 2014); this digitalization can support operational performance by making it easier to share information and real data—time (Helo et al., 2014). The digital platform is an example of digital technology that can integrate information (Helo et al., 2014). It supports visibility and decision-making between software and technologies (Chen et al., 2014). Digital platforms, as a form of software integration, provide opportunities for smooth information flow, communication, and connectivity within companies and in supply chains (Helo et al., 2014). Therefore, the first hypothesis in this study is:

H1: Digitalization has a positive effect on operational performance

Supply chain capability is important in supply chain operations and key to determining a company's success. Capability reflects the company's business activities internally in the supply chain. Therefore, capability can drive business performance related to product availability, convenience, and low distribution costs (Rajala & Hautala-Kankaanpää, 2023). Previous research revealed that integrating supply chain processes provides several supply chain and organizational benefits for supply chain partners. In addition, he explained that the results he got were that there was a positive relationship between supply chain capability and operational performance. Therefore, the second hypothesis in this study is:

H2: Supply Chain Capability has a positive effect on operational performance

Supply chain operations have embraced digital technology to achieve real-time visibility, fostering enhanced business connectivity (Chen et al., 2014). This phenomenon spans industries globally and is often called Industry 4.0 (Diez-Olivan et al., 2019). Consequently, technology plays a pivotal role in expediting the advancement of digitalized supply chains. Digital platforms provide

seamless information, communication, and connectivity conduits across companies and supply chains (Helo et al., 2014). According to (Rajala Hautala-Kankaanpää, 2023), digital platforms streamline information exchange and analysis within supply chains, optimizing the benefits derived from interactions. This holds particular significance in accessing data and information, especially in complex supply chains with multiple dispersed locations. Therefore, the third hypothesis in this study is:

H3: Digitalization has a positive effect on Supply Chain Capability

Supply chain capacity acts as an intermediary that functions as a mechanism for generating value between digital platforms and performance, as it assists companies in executing operational tasks within organizational processes. In contrast, digital platforms can be tailored to meet the company's specific needs (Rajala & Hautala-Kankaanpää, 2023). Past studies offer empirical validation for the role of supply chain capacity in mediating the relationship between digital resources and performance (Yu et al., 2020). Furthermore, earlier research has demonstrated that diverse digital resources and capabilities (Del Giudice et al., 2021) necessitate the mediating support of the company's capacity to enhance performance (Rajala & Hautala-Kankaanpää, 2023). Hence, the fourth hypothesis in this study is formulated as follows:

H4: Supply Chain Capability has a positive effect on mediating digitalization and operational performance

Previous research has predominantly focused on specific dimensions of digital culture, namely data-driven culture (Leal-Rodríguez et al., 2023), IT utilization, intentions to adopt internet-based supply chain management systems, big data analytics, and digital organizational culture (Martínez-Caro et al., 2020). Digital culture encompasses beliefs and values concerning the utilization of digital technology, influencing organizational operations facilitated by digital technology (Rajala & Hautala-Kankaanpää, 2023). Therefore, the fifth hypothesis in this study is as follows:

H5: Digital culture positively moderates the relationship between Digitalization and Supply Chain Capability.

Like organizational culture, digital culture is crucial in hindering the necessary changes required for companies to adopt more digital technologies (Buckingham, 2013). A commonly adopted approach is that digital culture is an influential organizational factor impacting the use of digital platforms and firm performance (Rajala & Hautala-Kankaanpää, 2023). Previous research has indicated that digital culture indirectly influences operational performance (Martínez-Caro et al., 2020); culture also affects the utilization and adoption of digital technology. Therefore, the sixth hypothesis in this study is formulated as follows:

H6: Digital culture positively moderates the relationship between digitalization and operational performance.

Digitalization aims to acquire data regarding shifts in the business landscape, consumer behavior, and competitive dynamics within the supply chain, necessitating organizations to recognize, acquire, and assemble pertinent information. Subsequently, this data is aggregated, refined, analyzed, and transformed into actionable formats to capitalize on the advantages of digitalizing the supply chain (Petrucci et al., 2023). Prior research has discovered a favorable correlation between digitalization and organizational performance. Conversely, certain studies contend that the direct impacts of digitalization on supply chain performance may be limited.

However, external data can bolster digital procurement capabilities and indirectly influence supply chain performance (Petrucci et al., 2023). An opinion expressed by (Wong et al., 2011) that digital connectivity can even damage coordination efficiency between organizations and reduce supply chain costs. Therefore, the seventh hypothesis in this study is:

H7: Digital connectivity harms operational performance

Technological uncertainty will prompt frequent alterations in product design and innovation, and organizations will attain a competitive edge through technological advancement. Additionally, an environment characterized by heightened technological instability encourages partners to utilize information technology to facilitate collaborative efforts, rendering supply chain operations more predictable (Knell, 2021). Previous research has indicated that performance declines in the presence of substantial technological turbulence (Wilden & Gudergan, 2015) while it fosters improved performance amidst technological turbulence. Companies are compelled by technological turbulence to adhere to and adapt to technological trends (Ogbeibu et al., 2020). Furthermore, technological turbulence stimulates collaboration with downstream partners (Knell, 2021). Therefore, the seventh hypothesis in this study is:

H8: Technological turbulence has a positive effect in moderating the relationship between digital connectivity and operational performance.

Referring to previous research results and the hypotheses developed, a research model is created, as depicted in the following.

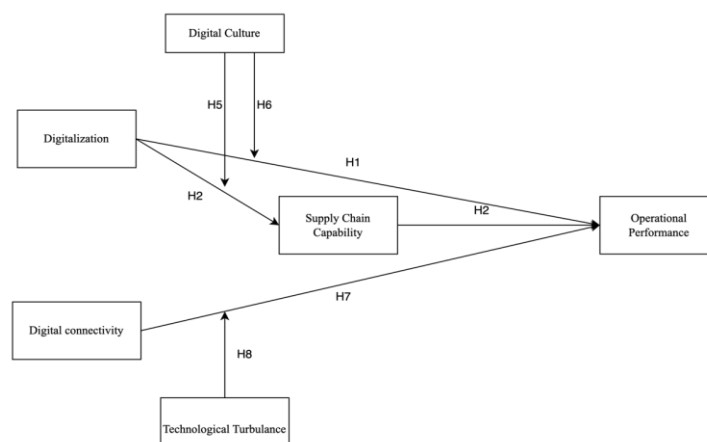


Figure 1. Framework

Source : (Rajala & Hautala-Kankaanpää, 2023)

METHOD

This research is quantitative with a descriptive approach, intending to describe the things that cause operational performance in PT.KAI (Persero) for the logistics department. The population of this study is all logistics employees who know the process of digitalization implementation. This sampling technique used is non-probability with purposive sampling. Research respondents must meet specific criteria, namely employee PT.KAI (Persero) and employee in the logistics department. The research sample was obtained through calculations from the Krejcie-Morgan table so that 48 respondents were found to fill out online questionnaires, which were distributed via the Google form. The research implementation time used in this study was cross-sectional because this research

was only carried out in one research period from the beginning to the completion of the research after successfully answering all research questions and drawing conclusions based on the statistical analysis carried out. The data collection duration is 60 days using descriptive analysis method with a quantitative approach through SEM (Structural Equation Modeling), specifically Partial Least Squares (PLS), with the application of the SmartPLS software to evaluate both external and internal models.

RESULTS AND DISCUSSION

Specific criteria must be adhered to to examine the directional impact, whether positive or negative, between variables. An analysis of the original sample values provides an initial understanding of the variables' influence. Subsequently, examining hypotheses concerning the effect of variable "x" on "y," along with direct effect testing, involves considering the t-statistic value. The effect is statistically significant if the t-statistic value surpasses 1.64 in a two-tailed test. Additionally, giving due consideration to the p-values is crucial. These values aid in determining the acceptance or rejection of hypotheses in our research. Hence, assessing the t-statistic and p-values is pivotal in gauging the significance of variable influence within this study. Below is a table depicting the outcome data derived from the t-statistic and p-value during the hypothesis testing phase of this research.

Table 1. Hypothesis Test

Hypothesis	Original sample	Sample mean	Standard deviation	t-statistic	p-value	Result
Digitalization is moderated by digital culture toward supply chain capability	-0.117	-0.114	0.054	2.192	0.029	Accepted
Digitalization is moderated by digital culture towards Operational performance	0.364	0.350	0.141	2.591	0.010	Accepted
Digital connectivity is moderated by Technological turbulence toward Operational performance	-0.342	-0.332	0.138	2.476	0.014	Accepted
Digital connectivity to Operational performance	-0.076	-0.019	0.344	0.222	0.825	Rejected
Digitalization of Operational performance	0.123	0.123	0.122	1.011	0.312	Rejected
Digitalization of Supply chain capability	-0.341	-0.336	0.166	2.054	0.041	Accepted
Supply chain capability on Operational performance	0.720	0.711	0.265	2.717	0.007	Accepted
Technological turbulence on Operational performance	0.427	0.393	0.135	3.161	0.002	Accepted

Source: Processed data by the author by using SmartPLS 3.0 (2023)

The first table yielded results indicating the rejection of 2 hypotheses, namely H1 and H7, as inferred from the p-value. Based on the results of hypothesis 1, the relationship between the variable "digitalization" and "operational performance" has a positive influence, as indicated by the original sample value of 0.123. However, this relationship is not significant. This conclusion is supported by the p-value of 0.312 > 0.05, indicating a lack of mutual influence between the hypotheses, and the

t-statistic of $1.011 < 1.64$, suggesting a non-significant impact. Based on the results of hypothesis 7, it is found that the p-value is 0.825, which is greater than 0.05, indicating a lack of mutual influence. However, the t-statistic value of 0.222 is greater than 1.64, suggesting that the variable has a significant impact. Therefore, it can be concluded that the variable "digital connectivity" positively influences "operational performance" because the total sample value is 0.123, even though the lack of mutual influence and lack of significance leads to the rejection of hypothesis H7.

The importance-performance map analysis, alternatively referred to as the importance-performance matrix analysis, constitutes one of the assessments that can be conducted within PLS-SEM to evaluate path coefficient estimates. This analysis considers the variable's average latent score (Sarstedt et al., 2021). The primary objective of carrying out an IPMA analysis is to aid managerial entities in identifying and discerning variables that hold relatively significant importance for the target construct. This discernment stems from the results obtained from variables examined in PLS-SEM that display a substantial total effect yet exhibit low-performance levels. As a result, these findings serve as the groundwork for formulating enhancements that necessitate heightened attention. This study aims to analyze the results of the interest and performance matrix analysis (IPMA) to evaluate the extent to which the performance of each independent variable contributes to the dependent variable. IPMA comprises four quadrants: Quadrant 1, referred to as "keep up the good work," represents high importance and high-performance values; Quadrant 2, known as "concentrate here," represents high importance and low-performance values; Quadrant 3, labeled as "low priority," indicates low importance and performance values; and the final quadrant, "possible overkill," corresponds to low importance and high-performance values. The following has been presented in a table that summarizes and describes each IPMA variable based on its importance and performance.

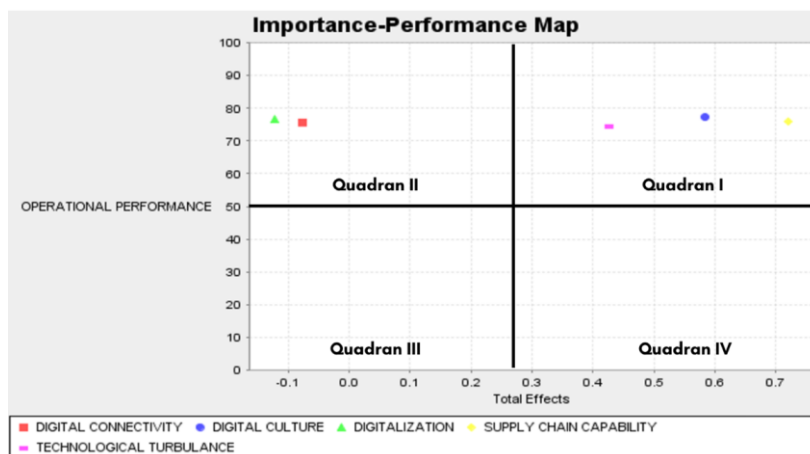


Figure 2. IPMA

Source: Processed data by the author by using SmartPLS 3.0 (2023)

Based on Figure 2. Table 2, presented below, explains the results of the performance and importance of each variable in this study:

Table 2. Performance of Variable

	Performances
Digital Connectivity	75.617
Digital Culture	77.250
Digitalization	76.595
Operational Performance	77.910
Supply Chain Capability	75.850
Technological Turbulence	74.407

Source: Processed data by the author by using SmartPLS 3.0 (2023)

From the summarized values presented in the table, it can be observed that digital connectivity holds a performance value of 75.617, followed by Digital Culture with a performance value of 77.250, digitalization with a performance value of 76.595, operational performance at 75.910, supply chain capability at 75.850, and technological turbulence at 74.407. Analyzing these outcomes, it can be inferred that among the variables, digitalization has the highest influence on the operational performance of PT.KAI when compared to the other variables.

The distribution of IPMA results is presented in the form of quadrants. At the same time, Table 4.23 elaborates on the calculation of IPMA results and showcases their importance compared to performance. This data is presented as a priority matrix and a map that categorizes the quadrants and IPMA outcomes. Consequently, the following conclusions can be drawn:

1. Digital Culture falls within quadrant I, known as "Keep up the good work," signifying that the variable holds a high level of importance or urgency and is linearly related to high performance, particularly with an already satisfactory performance achievement. Therefore, it is recommended for PT. KAI, especially its logistics division, must sustain its digital culture to ensure swift adaptation to future changes.
2. Supply Chain Capability falls within quadrant I, "Keep up the good work." This suggests that the variable holds high importance and urgency and correlates positively with high performance, especially when the current performance is already adequate. Hence, PT. KAI is advised to maintain its capability in managing and enhancing supply chain performance.
3. Technological turbulence is situated in quadrant I, referred to as "Keep up the good work." This indicates that the variable is highly important and urgent and positively correlated with high performance, particularly when the current performance is satisfactory. As a result, PT. KAI is recommended to continuously drive the company to stay within the technology wave, adapting to the environment.
4. Digitalization resides in quadrant II, termed "Concentrate here," portraying a scenario where the variable holds high importance or urgency but exhibits low performance. This variable demands heightened attention as a key component to be addressed in PT. KAI's future endeavors, considering its significance as perceived by the respondents.
5. Digital Connectivity falls within quadrant II, also labeled "Concentrate here." This situation indicates that the variable bears high importance or urgency, yet its performance is low. This variable requires extra attention as a crucial element to be considered in PT. KAI future actions, due to its perceived significance by the respondents.

CONCLUSION

Based on the findings from the analysis and hypothesis testing provide insights into the relationships between various variables. The digitalization variable positively correlates with operational performance, although the impact is insignificant. Conversely, the supply chain capability variable exerts a significant and favorable influence on operational performance, as the analysis outcomes indicate. Interestingly, while the digitalization variable is found to have a noteworthy impact, it does not yield a positive effect on supply chain capability, according to the findings. Furthermore, based on the analysis results, the supply chain capability variable is identified as a significant mediator in the relationship between digitalization and operational performance. The analysis highlights that the digital culture variable holds considerable influence, although it does not substantially moderate the connection between digitalization and supply chain capability.

Similarly, the digital connectivity variable is shown to possess substantial influence and effectively moderates the link between digitalization and operational performance. The analysis findings also reveal that although the digital culture variable lacks a significant impact, it maintains a positive association with operational performance. Lastly, the technological turbulence variable is inferred to hold substantial influence. At the same time, its moderating effect on the connection between digitalization and operational performance remains insignificant, according to the analysis and hypothesis testing outcomes.

Several key insights emerged from categorizing variables into distinct quadrants in the analysis. First, Digital Culture falls within Quadrant I, known as "Keep up the good work." This signifies that the variable holds high importance and urgency, aligning with a strong performance where achievements are already substantial. Therefore, a recommendation is put forth for PT. KAI, particularly the logistics division, to sustain the digital corporate culture. This will facilitate rapid adaptation to forthcoming changes.

Similarly, Supply Chain Capability occupies Quadrant I, also referred to as "Keep up the good work." This indicates that the variable boasts both significant importance and urgency. Moreover, it correlates positively with high performance, especially when the current performance is already satisfactory. As a result, it is advised that PT. KAI maintains its competence in enhancing and managing supply chain performance. Technological turbulence is situated in Quadrant I, designated "Keep up the good work." This portrayal underscores its substantial importance and urgency.

Furthermore, it demonstrates a positive correlation with elevated performance, especially when the present performance level is commendable. Thus, PT. KAI is encouraged to continue driving the company within the ongoing wave of technology, ensuring alignment with and adaptation to the evolving environment.

On the other hand, digitalization falls within Quadrant II, denoted as "Concentrate here." In this scenario, the variable is highly important and urgent, yet it exhibits low performance. This variable necessitates heightened attention as a key component that demands future consideration by PT. KAI, as it is deemed crucial by respondents. Similarly, Digital Connectivity, positioned in Quadrant II labeled "Concentrate here," highlights a situation where the variable holds considerable importance and urgency, yet its performance remains subpar. Thus, this variable also calls for enhanced attention as a crucial element in PT. KAI's future focus is underscored by the significance attributed to it by respondents.

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