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Navigating Industry 4.0: The Strategic Role of Dynamic Capabilities in Transforming Indonesian Manufacturing

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Abstract: Incorporating industry 4.0 technologies into manufacturing operations is hindered by significant organizational and managerial challenges. This research addresses the problem of insufficient organizational and managerial strategies in embracing industry 4.0 within Indonesian manufacturing companies. Utilizing a quantitative approach, data was collected through a survey distributed among Indonesian manufacturers. The collected data was analyzed using PLS-SEM to identify the critical factors influencing successful Industry 4.0 integration. The findings highlight the critical role of dynamic capabilities – sensing, seizing, and reconfiguring – in enhancing Industry 4.0 capabilities. By fostering these dynamic capabilities, companies can effectively integrate Industry 4.0 technologies, leading to increased competitiveness and operational efficiency within the Indonesian manufacturing sector. This study offers valuable insights for managers and policymakers as they navigate the challenges of Industry 4.0 and build a robust manufacturing ecosystem in Indonesia.

Keywords: Dynamic capabilities, Industry 4.0 capabilities, Manufacturing companies PLS-SEM.

INTRODUCTION

The Indonesian government is trying to encourage the industry 4.0 initiative as a strategy to spur economic growth towards its ambition to be among the top 10 world economies. The manufacturing industry as one of the largest contributors to the economy was chosen to be used as a pilot project with the launch of the "Making Indonesia 4.0" roadmap in 2018. However, the transition towards implementing Industry 4.0 technology did not take place without obstacles. Various factors such as obscure Industry 4.0 policies, high risk investments, insecurity of data exchange, lack of skillful men power, and unclear incentives from the government, are identified as major roadblocks to this adoption process (Fernando et al., 2022)

An assessment carried out by the Ministry of Industry in 2019 using the INDI 4.0 readiness index on 326 manufacturing companies in Indonesia, highlighted that companies exhibited a moderate level of readiness to integrate Industry 4.0 advanced technologies. The finding shows that, apart from the low level of application of advanced technology, the main challenge faced is the limited knowledge and ability of company management in designing programs and roadmaps for transformation towards Industry 4.0 (Paryanto, 2021). This finding aligns with a survey carried out by Deloitte (Deloitte, 2020), of 2000 company executives in

19 countries, only 10% of companies had a comprehensive and holistic strategy in adopting Industry 4.0.

Industry 4.0 is characterized by seamless connectivity across manufacturing processes, both within factories and across the supply chain, accompanied by the widespread application of electronic and information technology across manufacturing and service sectors (Roblek et al., 2016), (Dalenogare et al., 2018). Definition of industry 4.0 technology in the context of the Dynamic Capability View (DCV) is a set of technological capabilities, organizational structures, and human resources, collectively known as industry 4.0 capabilities (A. W. (A) AL-Khatib, 2023). According to Felsberger (Felsberger et al., 2022), industry 4.0 capabilities foster seamless collaboration across departments, thereby improving operational capabilities. Strong operational capabilities are recognized as key factors in enhancing operational performance. Empirical findings provided by existing studies (A. W. (B) AL-Khatib, 2023), (Toorajipour et al., 2021) confirm the significance of industry 4.0 capabilities in improving operations performance.

There are several factors that could affect the application of industry 4.0 in a company. These factors also need to be analyzed. Implementing Industry 4.0 is not solely about adopting new technology (Agostini & Filippini, 2019), (Piccarozzi et al., 2018), it also hinges on organizational and managerial strategies (Ozen-Ozkan et al., 2020). In facing these challenges, dynamic capabilities can play an important role in helping companies adapt to rapidly changing business environments (Winter, 2003). An organization's ability to acquire and integrate new knowledge and technology can be enhanced by dynamic capabilities (Cho et al., 2023)boosting innovation levels and operational performance. The implementation of innovative technologies that improve industry 4.0 capabilities can be facilitated by dynamic capabilities (Chatterjee et al., 2023), therefore, dynamic capabilities enable these companies to develop the abilities to innovate by offering the ability to handle data, artificial intelligence systems, and machine learning (Lepore et al., 2023).

Teece (Teece et al., 1997) defined dynamic capabilities into three primary clusters: (1) sensing, the ability to detect opportunities and challenges; (2) seizing, the ability to catch opportunities and turn it into tangible outcome with economic and moral value; and (3) reconfiguring, the ability to mobilize and exploit resources and turn them into new business values. The combination of these three abilities as dynamic capabilities helps companies enhance their exploration capabilities through sensing (Ellström et al., 2022), capitalize on new opportunities by integrating them into internal routines (Atiku & Abatan, 2021), and reconfigure resources for sustainable reform and organizational change (Lepore et al., 2023), enhancing the adaptability of their resources and assets to technological advancements (Aghimien et al., 2022).

Recently, there has been a growing interest in empirical studies. about the significance of dynamic capabilities, and in particular the capability of dynamic technology in improving performance (Eslami et al., 2021; Wu et al., 2023) is increasing. Recent studies emphasize the significance of dynamic capabilities in enhancing a firm's capacity to acquire and assimilate novel knowledge and technology, thereby elevating levels of innovation and operational efficiency.

Based on recent research in academic works, more research is needed to observe the adoption of Industry 4.0 capabilities. It is crucial to understand the antecedents of Industry 4.0 capability for effectively deploying this new technology (Laskurain-Iturbe et al., 2023). This study aligns with prior research in literature which shows that the company's dynamic capabilities facilitate new technology adoption (Gupta et al., 2020), thus empowering to leverage the benefits of industry 4.0 capacity in these organizations

METHOD

This research employs quantitative method through a survey, with manufacturing companies in Indonesia as the research population. The research successfully collected 123 valid responses from participants holding strategic positions in the operations of a manufacturing company, who were chosen via a purposive sampling method. Research data was acquired through the distribution of online questionnaires. The questionnaires included statement items utilizing a Likert scale ranging from 1 to 5. The research data analysis was performed using Partial Least Squares Structural Equation Modeling (PLS-SEM) technique via the SmartPLS 4.1 software. The data analysis process involves verifying validity, testing reliability, and conducting hypothesis testing. The independent variable comprises dynamic capabilities, encompassing sensing, seizing, and reconfiguring, while the dependent variable is industry 4.0 capabilities.

The research hypothesis as illustrated in Fig. 1.

H1: Sensing capability has a positive and significant relationship with industry 4.0 capabilities.
H2: Seizing capability has a positive and significant relationship with industry 4.0 capabilities.
H3: Reconfiguring capability has a positive and significant relationship with industry 4.0 capabilities.

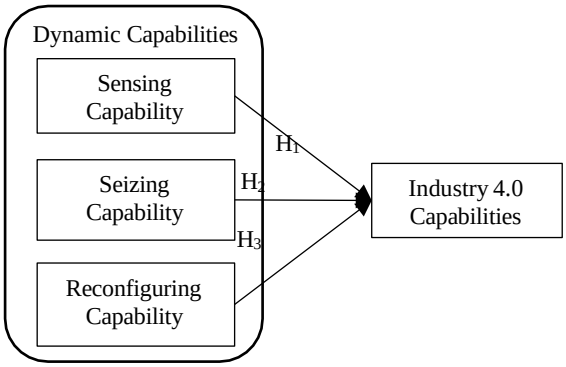


Fig. 1. Research Model

RESULTS AND DISCUSSION

`Validity & Reliability Test

In the initial stage, the focus is on evaluating the validity and reliability. To be considered as valid, the indicators are required to have loading factor value exceeds 0.70. This threshold ensures that each indicator has a strong correlation with the underlying factor, demonstrating its validity in measuring the construct. The model will exclude indicators with loading factor values below 0.70. The reliability test employs composite reliability, deemed valid when exceeding 0.70, and Cronbach's alpha must surpass 0.60. Two indicators with loading factor values below 0.70 are shown in Fig. 2 below, SEN3 and KI5. As such, both indicators are removed from the model, and the test is then run for the new model.

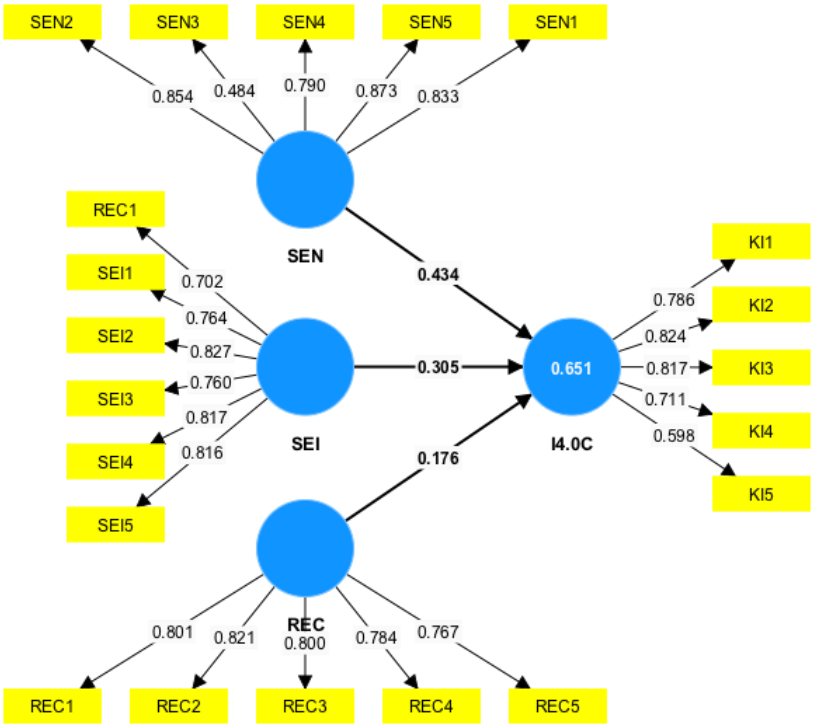


Fig 2. Validity Testing

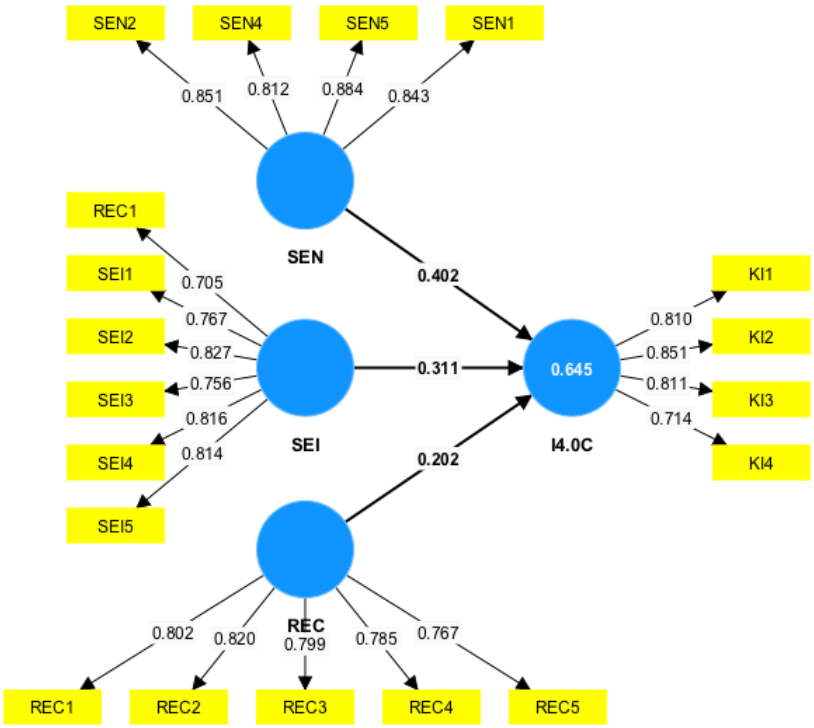


Fig 3. Validity Testing After Deletion

The Fig. 3 above shows that all indicators have the value of loading factor higher than 0.7. So, the new model meets the convergent validity criteria. Table 1 indicates that all variables surpass the thresholds of 0.70 for composite reliability and 0.60 for Cronbach's alpha. Therefore, it can be inferred that all variables satisfy the requirements.

Table 1. Reliability Test

	Cronbach's alpha	rho_a	Composite reliability (rho_c)	Average variance extracted (AVE)
Industry 4.0 capabilities	0.809	0.82	0.875	0.637
Reconfiguring	0.854	0.856	0.896	0.632
Seizing	0.873	0.883	0.907	0.662
Sensing	0.869	0.876	0.911	0.719

Based on Table 2 below, the results of the Heterotrait-Monotrait (HTMT) calculation for all variables have values smaller than 0.90. So, it can be decided that each construct variable can form its own latent variable and has met the HTMT criteria.

Table 2. Discriminant Validity

	Industry 4.0 capabilities	Reconfiguring	Seizing	Sensing
Industry 4.0 capabilities				
Reconfiguring	0.815			
Seizing	0.755	0.703		
Sensing	0.854	0.750	0.620	

Collinearity VIF

Assessing multicollinearity in a regression model involves calculating the Variance Inflation Factor (VIF). This step quantifies the extent to which the accuracy of regression estimates is affected by independent variables that are closely related. If the VIF exceeds 5, it shows there's a multicollinearity issue between the independent variables. As shown in Table 3, the VIF values were all below 5. It implies that there are no indications of multicollinearity in the model.

Table 3. Collinearity (VIF)

	Industry 4.0 capabilities
Reconfiguring	2.099
Seizing	1.728
Sensing	1.856

f2 Effect Sizes Evaluation

Hair et al. (2019) (Hair et al., 2019) outlines that an f2 value of 0.02 reflects a small effect, 0.15 indicates a moderate effect, and 0.35 suggests a large effect. Based on Table 4 it describes that sensing variable, which has the highest f2 value of 0.248 represents the medium effect, while seizing and reconfiguring variable, with the f2 value of 0.126 and 0.085 respectively represents a small effect.

Table 4. f2 Effect Sizes Evaluation

	Industry 4.0 capabilities
Reconfiguring	0.085
Seizing	0.126
Sensing	0.248

Q2 Evaluation

The model holds predictive relevance for specific endogenous constructs when the Q2 value exceeds 0. In contrast, poor predictive relevance is indicated by values of 0 and below. The Q2 value for the industry 4.0 capabilities variable in Table 5 is 0.392, which is exceeds 0. This suggests that the variable demonstrates predictive relevance.

Table 5. Q2 Evaluation

	Q2
Industry 4.0 capabilities	0.392

R2 Evaluation

From the R-square table, one can infer that 64.6% of industry 4.0 capabilities are explained by the variables in the model, implying that external variables beyond the study's scope might affect the remaining portion.

Table 6. R2 Evaluation

	R-square	R-square adjusted
Industry 4.0 capabilities	0.646	0.637

Hypothesis Testing

Hypothesis testing is a vital step in analyzing data, helping to determine if our assumptions about the population are supported by the evidence from our sample. The conditions for this testing include a T value exceeding 1.657 and a P value below 0.050. As indicated in Table 7, all hypotheses are supported.

Table 7. Hypothesis Testing

Correlation	T Statistics	P values	Conclusion
Reconfiguring -> Industry 4.0 capabilities	3.050	0.001	Supported
Seizing -> Industry 4.0 capabilities	2.922	0.002	Supported
Sensing -> Industry 4.0 capabilities	4.427	0.000	Supported

Discussion

H1: The relationship between sensing and industry 4.0 capabilities

The analysis of Table 7 reveals a significant relationship between the variables, as indicated by a P value of < 0.05. This finding confirms that higher sensing capabilities correspond to higher Industry 4.0 capabilities, a conclusion that aligns with prior studies (A. W. AL-Khatib et al., 2023; Lepore et al., 2023). This finding emphasizes the pivotal role that sensing capability plays in driving Industry 4.0 advancements within manufacturing companies.

Sensing capability serves as the foundation upon which companies can build their adaptive strategies in response to external stimuli. By effectively identifying opportunities and threats in the external environment, manufacturing companies can tailor their operations to capitalize on favorable conditions and mitigate potential risks. This adaptive capacity is crucial for maintaining competitiveness in today's rapidly evolving business landscape.

To foster sensing capability, manufacturing companies must implement strategies such as market research and intelligent marketing. These methods facilitate understanding of customer needs (Hunt & Madhavaram, 2020). By gaining insights into consumer preferences and behaviors, companies can align their product development and marketing strategies more effectively, thus enhancing their competitive positioning.

Additionally, companies should establish digital sensing capabilities to monitor technological advancements, companies can track emerging technologies and assess their potential impact on business operations (Ellström et al., 2022). This proactive approach enables companies to identify opportunities for innovation and efficiency gains, thereby driving continuous improvement and adaptation in the industry 4.0 landscape.

Furthermore, sensing capabilities empower companies to more adeptly recognize external opportunities and threats (Teece et al., 2016), thereby mitigating risks associated with

Industry 4.0 technology adoption (Drydakis, 2022). The development of robust sensing capability is essential for manufacturing companies seeking to navigate the dynamic landscape of Industry 4.0 effectively and sustainably.

H2: The relationship between seizing and industry 4.0 capabilities

A significant relationship between seizing and industry 4.0 capabilities is also evident from the analysis of Table 7, as demonstrated by a P value of < 0.05. Therefore, it is concluded that a significant relationship between the two variable exists. Industry 4.0 capabilities are positively impacted by seizing capability. by capturing opportunities or mitigating threats and leveraging them for the benefit of the company.

According to Atiku & Abatan (Atiku & Abatan, 2021), seizing capability refers to the capability of a company to capture opportunities and convert them into the organization's internal routines, and subsequently exploiting them to enhance business efficiency and effectiveness. This definition highlights the dynamic nature of seizing capabilities, emphasizing their role in driving organizational adaptability and innovation. By leveraging as many opportunities as possible, seizing capability facilitates administrative and organizational commitment towards goals (Lepore et al., 2023), as merely identifying sources of opportunities is insufficient for goal attainment (Ellström et al., 2022). Thus, it becomes imperative to employ these capabilities to translate the opportunities into tangible realities in the field.

When embracing new technologies like Industry 4.0, organizations may encounter various challenges, including fear of risk, uncertainty avoidance, or reluctance toward technology (Laskurain-Iturbe et al., 2023). In response to these challenges, possessing seizing capabilities becomes indispensable. By formulating rules, procedures, and policies that endorse and facilitate the adoption and utilization of new technologies, organizations can effectively leverage seizing capabilities to enhance the adoption and integration of Industry 4.0 technologies (Garbellano & Da Veiga, 2019). Seizing capabilities are crucial in driving organizational agility, innovation, and competitiveness in the industry 4.0 landscape. By enabling organizations to capture opportunities, mitigate threats, and adapt to changing market dynamics, seizing capabilities empower organizations to realize their strategic objectives and thrive in an increasingly digital and interconnected world.

H3: The relationship between reconfiguring and industry 4.0 capabilities

The data in Table 7 is showing the P value is < 0.05, indicating the significance of relationship between the variables. Reconfiguring capabilities play a pivotal role in managing the existing resources owned by a company, empowering them to adapt effectively to changes in the environment. This adaptability is crucial for maintaining smooth and routine operations within the dynamic business (Jantunen et al., 2018).

At its core, reconfiguring capability entails identifying, organizing, and coordinating the regulated resources and assets that a company (Teece et al., 2016). By harnessing the competencies, skills, and knowledge possessed by individuals within the organization, both implicit and explicit, companies can leverage their existing resources effectively (Ellström et al., 2022). Additionally, reconfiguring capabilities focus on enhancing organizational learning capabilities, facilitating knowledge exchange among individuals within the company (Jantunen et al., 2018). This fosters the development of a flexible and robust knowledge base essential for sustaining company operations amidst changing circumstances.

Reconfiguring capability encompasses different factors that allowing firms to translate their resources into tangible value. These factors involve state-of-the-art technological equipment, databases, administrative structures such as organizational frameworks, rules, and policies, as well as standards and organizational culture (Ellström et al., 2022). By aligning these elements with organizational goals and objectives, companies can enhance their capacity

to adapt to evolving market dynamics and technological advancements. In the context of Industry 4.0, reconfiguring capabilities are particularly crucial for preparing organizations for continuous updates and changes in organizational routine (Lepore et al., 2023).

This proactive approach ensures that company resources and assets remain compatible with technological changes, thereby enhancing Industry 4.0 capabilities (Aghimien et al., 2022). Consequently, to align their assets and resources with dynamic changes and innovative digital strategies, companies must prioritize the development of their reconfiguring capabilities.

CONCLUSION

The outcomes of the data analysis indicate that sensing, seizing, and reconfiguring capabilities as part of dynamic capabilities, each have a positive and significant correlation with Industry 4.0 capabilities in manufacturing companies in Indonesia. Specifically, sensing capabilities enable companies to effectively identify external opportunities and threats, seizing capabilities allow companies to capture and convert these opportunities into actionable strategies, and reconfiguring capabilities facilitate the adaptation and management of resources to align with environmental changes.

Therefore, it can be concluded that these dynamic capabilities collectively enhance the overall Industry 4.0 capabilities of manufacturing companies. The novelty of this research lies in establishing a comprehensive model that elucidates the relationship between dynamic capabilities and Industry 4.0 capabilities within the context of Indonesian manufacturing firms. This model highlights the critical role of sensing, seizing, and reconfiguring capabilities in fostering technological adaptation and operational efficiency. Consequently, manufacturing companies must prioritize the development of these dynamic capabilities to handle the complexities of the industry 4.0 landscape successfully.

Managers in manufacturing companies should focus on both internal and external factors to effectively enhance their Industry 4.0 capabilities. This involves conducting thorough market research to understand technological trends and customer needs, implementing intelligent marketing strategies that utilize digital tools and data analytics, and fostering a culture of continuous learning and adaptation to new technologies.

By doing so, companies can build stronger communication channels with customers, enhance brand loyalty through personalized and responsive interactions, and maintain a competitive edge in the rapidly evolving Industry 4.0 landscape. This research is limited by its use of a cross-sectional analysis, due to various situational and environmental factors influencing the companies, it may not fully capture the long-term impacts and relationships between variables.

Additionally, studies conducted at a single point in time may overlook time lags in the relationships between variables. Hence, it is recommended that future research adopts a longitudinal approach to offer more robust managerial insights at the organization level. Future research should explore how dynamic capabilities (sensing, seizing, and reconfiguring) impact the implementation of industry 4.0 technologies in the service industry and SMEs. This research could investigate customer-centric strategies and the role of digital transformation in improving service delivery and operational efficiency. By focusing on these areas, future studies can provide valuable insights into best practices and common challenges, helping service-oriented businesses and SMEs leverage Industry 4.0 technologies to enhance competitiveness and customer satisfaction.

REFERENCES

Aghimien, D., Aigbavboa, C. O., Oke, A. E., Edwards, D., Thwala, W. D., & Roberts, C. J. (2022). Dynamic capabilities for digitalisation in the AECO sector – a scientometric review. *Engineering, Construction and Architectural Management*, *29*(4), 1585–1608.

Agostini, L., & Filippini, R. (2019). Organizational and managerial challenges in the path toward industry 4.0. *European Journal of Innovation Management*, *22*(3), 406–421. https://doi.org/10.1108/EJIM-02-2018-0030

AL-Khatib, A. W. (A). (2023). The impact of Industry 4.0 capabilities on operational performance: the mediating effect of supply chain ambidexterity. *The TQM Journal*. https://doi.org/https://doi.org/10.1108/TQM-06-2023-0193

AL-Khatib, A. W. (B). (2023). Internet of things, big data analytics and operational performance: the mediating effect of supply chain visibility. *Journal of Manufacturing Technology Management*, *34*, 1–24. https://doi.org/10.1108/JMTM-08-2022-0310

AL-Khatib, A. W., Shuhaiber, A., Mashal, I., & Al-Okaily, M. (2023). Antecedents of Industry 4.0 Capabilities and Technological Innovation: A Dynamic Capabilities Perspective. *European Business Review*.

Atiku, S. O., & Abatan, A. A. (2021). Strategic capabilities for the sustainability of small, medium, and micro enterprises. . *Reshaping Entrepreneurship Education with Strategy and Innovation*, 17–44. https://doi.org/10.4018/978-1-7998-3171-6.ch002

Chatterjee, S., Chaudhari, R., & Shams, R. (2023). Applications of industry 4.0 for pandemic responses and business continuity: a TOE-DCV integrated approach. *IEEE Transactions on Engineering Management*. https://doi.org/10.1109/TEM.2023.3250587

Cho, H. E., Jeong, I., Kim, E., & Cho, J. (2023). Achieving superior performance in international markets: the roles of organizational agility and absorptive capacity. *Journal of Business and Industrial Marketing*, *38*(4), 736–750. https://doi.org/10.1108/JBIM-09-2021-0425

Dalenogare, L. S., Benitez, G. B., Ayala, N. F., & Frank, A. G. (2018). The expected contribution of industry 4.0 technologies for industrial performance. *International Journal of Production Economics*, *204*, 383-394. https://doi.org/https://doi.org/10.1016/j.ijpe.2018.08.019

Deloitte. (2020). *Industry 4.0 Readiness Report*. Https://Www.Deloitte.Com/Za/En/Services/Risk-Advisory/Perspectives/Industry-4-0-Readiness-Report.Html.

Drydakis, N. (2022). Artificial intelligence and reduced SMEs' business risks. A dynamic capabilities analysis during the covid-19 pandemic. *Information Systems Frontiers*, *24*(4), 1223-1247.

Ellström, D., Holtström, J., Berg, E., & Josefsson, C. (2022). Dynamic capabilities for digital transformation. *Journal of Strategy and Management*, *15*(2), 272-286. https://doi.org/10.1108/ JSMA-04-2021-0089

Eslami, M. H., Jafari, H., Achtenhagen, L., Carlbäck, J., & Wong, A. (2021). Financial performance and supply chain dynamic capabilities: the Moderating Role of Industry 4.0 technologies. *International Journal of Production Research*, 1–18.

Felsberger, A., Qaiser, F. H., Choudhary, A., & Reiner, G. (2022). The impact of Industry 4.0 on the reconciliation of dynamic capabilities: evidence from the European manufacturing industries. *Production Planning and Control*, *33*, 277–300. https://doi.org/http://dx.doi.org/10.1080/09537287.2020.1810765

Fernando, Y., Wahyuni, I. S., Gui, A., Ikhsan, R. B., Mergeresa, F., & Ganesan, Y. (2022). A mixed-method study on the barriers of industry 4.0 adoption in the Indonesian SMEs manufacturing supply chains. *Journal of Science and Technology Policy Management*,

Vol. 14 No. 4, 14(4), 678–695. https://doi.org/https://doi.org/10.1108/JSTPM-10-2021-0155

Garbellano, S., & Da Veiga, M. (2019). Dynamic capabilities in Italian leading SMEs adopting industry 4.0. *Measuring Business Excellence*, *23*(4), 472-483.

Gupta, S., Modgil, S., Gunasekaran, A., & Bag, S. (2020). Dynamic capabilities and institutional theories for industry 4.0 and digital supply chain. *Supply Chain Forum: An International Journal*, *21*(3), 139-157.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*.

Hunt, S. D., & Madhavaram, S. (2020). Adaptive marketing capabilities, dynamic capabilities, and renewal competences: The "outside vs. inside" and "static vs. dynamic" controversies in strategy. *Industrial Marketing Management*, *89*, 129-139.

Jantunen, A., Tarkiainen, A., Chari, S., & Oghazi, P. (2018). Dynamic capabilities, operational changes, and performance outcomes in the media industry. *Journal of Business Research*, *89*, 251-257.

Laskurain-Iturbe, I., Arana-Landin, G., Landeta-Manzano, B., & Jimenez-Redal, R. (2023). Assessing the uptake of industry 4.0 technologies: barriers to their adoption and impact on quality management aspects. . *International Journal of Quality and Reliability Management*, *40*(10).

Lepore, D., Vecciolini, C., Micozzi, A., & Spigarelli, F. (2023). Developing technological capabilities for Industry 4.0 adoption: an analysis of the role of inbound open innovation in small and medium-sized enterprises. *Creativity and Innovation Management*. https://doi.org/https://doi.org/10.1111/caim.12551

Ozen-Ozkan, Y. D., Kazancoglu, Y., & Mangla, S. K. (2020). Synchronized barriers for circular supply chains in industry 3.5/industry 4.0 transition for sustainable resource management. *Resources, Conservation and Recycling*, *161*. https://doi.org/10.1016/j.resconrec.2020.104986

Paryanto. (2021). Industry 4.0 dan Kesiapan Industri Manufaktur di Indonesia. In J. U. D. Hatmoko (Ed.), *Revolusi Industri 4.0* (Vol. 1, p. 33). Andi.

Piccarozzi, M., Aquilani, B., & Gatti, C. (2018). Industry 4.0 in Management Studies: A Systematic Literature Review. *Sustainability*. https://doi.org/10.3390/su10103821

Roblek, V., Meško, M., & Krapež, A. (2016). A complex view of Industry 4.0. *Sage Open*, *6*(2). https://doi.org/10.1177/2158244016653987

Teece, D. J., Peterav, M., & Leih, S. (2016). Dynamic Capabilities and Organizational Agility: Risk, Uncertainty, and Strategy in the Innovation Economy. *California Management Review*, 13–35.

Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. . *Strategic Management Journal*, *18*(7), 509–533. https://doi.org/https://doi.org/10.1002/(SICI)1097-0266(199708)18:7<509::AID-SMJ882>3.0.CO;2-Z

Toorajipour, R., Sohrabpour, V., Nazarpour, A., Oghazi, P., & Fischl, M. (2021). Artificial intelligence in supply chain management: a systematic literature review. *Journal of Business Research*, *122*, 502–517. https://doi.org/10.1016/j.jbusres.2020.09.009

Winter, S. (2003). Understanding Dynamic Capabilities. *Strategic Management Journal*, *24*, 991–995. https://doi.org/https://doi.org/10.1002/smj.318

Wu, Q., Yan, D., & Umair, M. (2023). Assessing the role of competitive intelligence and practices of dynamic capabilities in business accommodation of SMEs. *Economic Analysis and Policy*, 1103–1114.