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The impact of managerial capabilities, adhocracy culture and knowledge sharing on innovation capabilities and performance

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ABSTRACT

Technology advances rapidly and is used to increase the company's performance in the Industry 4.0 era. This phenomenon has signified disruption among companies owing to the use of this technology. Studies have demonstrated the importance of innovation in overcoming this situation. It was recognized and applied regularly and persistently by Astra Group, a major Indonesian conglomerate. Previous studies have introduced at least three factors that improve a company's innovation capabilities for better performance: managerial capabilities, adhocracy culture and knowledge sharing. However, the simultaneous effects of such factors on an organization's ability to innovate for improved performance are not widely recognized. Therefore, it is essential to examine closely how managerial skills, adhocracy culture and knowledge sharing affect group performance and innovation capabilities to better comprehend the company's understanding of and contribution to the field of innovation capability knowledge. The research methodology used in this study was quantitative in which 233 professionals in a group with managerial level and above positions were contacted and interviewed using 30-item questionnaires. Data from the responses were analyzed using thematic analysis with SmartPLS 4. The results show that managerial capability, adhocracy culture and knowledge sharing significantly impact innovation capabilities and increase performance across the Astra Group. Thus, it is confirmed that a company's innovation performance can be increased by improving its innovation capability where it can only be done if the company enhances managerial capability, adhocracy culture and knowledge sharing simultaneously.

Contribution/Originality: This study investigates how companies can increase their innovation performance through innovation capability to avoid being irrelevant in the market. It emphasizes how three factors such as managerial capabilities, adhocracy culture and knowledge sharing impact innovation capabilities to increase innovation performance which were not investigated simultaneously in the previous studies.

1. INTRODUCTION

Industry Revolution 4.0 has disrupted the business world. Companies must face uncertainty in winning the competition. Kodak and Nokia have shown that failure to adapt to the situation can make the company irrelevant, lose its customers and at worst disappear from the market (Baxter, Trott, & Ellwood, 2023). Thus, innovation is required to benefit customers (Cornell University, INSEAD, & WIPO, 2017). As previous studies have confirmed, the ability to do so continuously is known as innovation capability which is influenced by managerial capabilities,

adhocracy culture and knowledge sharing in increasing the company's innovation performance (Smith, Busi, Ball, & Van Der Meer, 2008). Some organizations, like the Astra Group, a large conglomerate corporation in Indonesia have been implementing it continuously and persistently since 1982, although it is necessary.

However, there is a lack of knowledge on how those factors, including managerial capabilities, adhocracy culture and knowledge sharing are integrated to promote a corporation's innovation capabilities and performance. Therefore, measuring the impact of these three factors on a company's innovation capabilities and performance, particularly in the Astra group is important for building a company's competitive advantage. For this reason, this research will investigate how managerial capabilities, adhocracy culture and knowledge sharing impact innovation capabilities and performance with a case study of the Astra Group in Indonesia that has not yet been fully understood.

The objective of this study is to theoretically contribute to the knowledge of the factors empirically proven to impact innovation capabilities and performance. Managerial implications are also targeted after obtaining empirical evidence from these factors. Based on this evidence, improvement recommendations from the managerial aspect can be drawn to effectively manage innovation and deliver better innovation performance to the company. This study aims to strengthen and provide suggestions for innovation practices in Indonesian companies.

This study aims to provide benefits to society in addition to this objective. For scholars, the results of this research are expected to serve as a reference regarding the factors impacting the innovation capabilities and performance of Indonesian companies especially the three above-mentioned factors which have not yet been comprehensively and wholly tested empirically. Business practitioners aim to provide insight into the factors needed to increase innovation capabilities and performance in Indonesian companies. This study is novel in that the three factors such as managerial capabilities, adhocracy culture and knowledge sharing are integrated as a model to empirically test their relationship to a company's innovation capabilities which are correlated with innovation performance. This contrasts with the literature in which these factors have been proven to have an impact on innovation capabilities that correlate with innovation performance (Iddris, 2016; Kyrgidou & Spyropoulou, 2013; Mendoza-Silva, 2021; Yeşil & Doğan, 2019).

2. LITERATURE REVIEW

A conceptual model is based on previous studies to cover the three factors that impact innovation capabilities as shown in Figure 1.

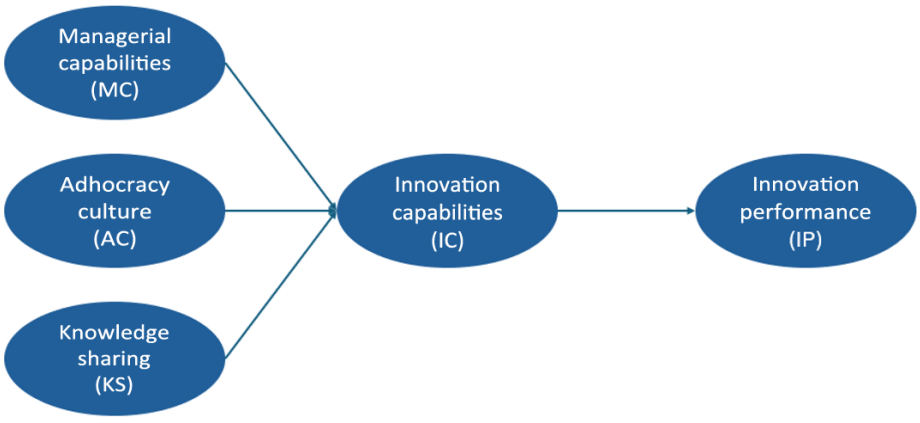

Figure 1. Conceptual model.

As depicted in the figure, these factors are managerial capabilities as stated by Ardichvili, Page, and Wentling (2003), Kyrgidou and Spyropoulou (2013) and Song and Parry (1996) adhocracy culture by Quinn and Cameron (2011) and Valencia, Valle, and Jiménez (2010), knowledge sharing by Chang, Liao, and Wu (2017), Lin, Chen,

and Kuan-Shun Chiu (2010) and Podrug, Filipović, and Kovač (2017). Additionally, at least four hypotheses were examined using the model depicted in Figure 1.

First, managerial capabilities (MC) have a significantly positive impact on innovation capabilities (IC) (H1). According to Ucbasaran, Westhead, and Wright (2008) these capabilities may provide opportunities to be revealed and developed. This is especially important because higher managerial capabilities can help a company convert ideas into opportunities (Ardichvili et al., 2003). In addition to style and leadership, management ability plays a significant role in innovativeness (Kyrgidou & Spyropoulou, 2013). In addition, top management commitment is needed to promote innovation functions and management (Harrington, 2021) especially to stimulate innovation performance (Prajogo & Ahmed, 2006). Chen, Tee, and Chang (2022) reported that there is empirical evidence that leaders' networks improve innovation efficiency. This construct is necessary especially for proposing and implementing innovative ideas (Batistič, Kenda, Premru, & Černe, 2022). Managerial capabilities are a crucial part of enhancing innovation capabilities (Munna, Shaikh, & Mazumdar, 2023).

Second, adhocracy culture (AC) has a positive impact on innovation capabilities (IC) (H2). Previous studies have found that support from top management, strategy, culture and knowledge infrastructure is required to promote innovation (Üçler & Yavuz, 2019). Kostis (2021) finds that culture has an impact on innovation and economic development in the organization. These four types of culture appreciate creativity, entrepreneurship and risk-taking which are positively correlated with the innovation capabilities of the company (Quinn & Cameron, 2011). Adhocracy culture has also been shown to influence product innovation positively (Valencia et al., 2010). This culture also enhances innovation capabilities within start-up companies (Yasmina & Etikariena, 2022).

Third, knowledge sharing (KS) has a significantly positive impact on innovation capabilities (IC) (H3). Previous studies have also found that knowledge management and continual innovation are significantly related to organizations (Abbas et al., 2020). Employees' willingness to share and collect knowledge enables companies to increase their innovation capabilities (Podrug et al., 2017). Knowledge sharing also positively influences innovation capability (Chang et al., 2017). Furthermore, knowledge sharing through both intrinsic and extrinsic motivations has been proven to enhance social innovation capabilities in non-profit organizations (Fait, Magni, Perano, Farina Briamonte, & Sasso, 2023).

Fourth, innovation capabilities (IC) have a significant and positive impact on innovation performance (IP) (H4). The stronger a company's innovation capabilities, the higher its innovation performance (Mir, Casadesús, & Petnji, 2016). Samson, Gloet, and Singh (2017) indicated a positive relationship between innovation capabilities and performance. Innovation itself is considered very important especially in a turbulent era where it can push metamorphosis based on an entrepreneurial spirit to increase a company's strategic resilience (Morais-Storz, Platou, & Norheim, 2018). Companies that innovate products and services will achieve better innovation performance than other companies (Shin, Kim, Jung, & Kim, 2022). It also positively affects innovation performance in technology-focused manufacturing companies (Çakir, Zehir, & Adigüzel, 2022).

3. METHODOLOGY

The methods used in this study included data collection and analysis. Purposive sampling was used to collect data from the questionnaire; thus, only targeted respondents at the manager and director levels of Astra Groups were included in the study. It was not accessible to the general public.

The questionnaire was pre-tested with managers and directors in charge of the innovation movement of the 39 large companies in the group. Five or six respondents were found to be spread among 39 companies out of the total 233 respondents that were contacted to provide the questionnaire. This number is above the minimum required size of 150 which is five times 30 questions in the questionnaire (Hair, Hult, Ringle, & Sarstedt, 2022).

A pre-test was also conducted to effectively ensure the understanding of all respondents and during the administration of the questionnaire; accompaniment was given to ensure that all respondents had objectively

responded to as required. Back-translation was also conducted to ensure that both the Indonesian and English versions of the questionnaire were correct. After the data were collected, a thorough analysis was conducted based on Partial Least Square Structural Equation Modelling (PLS-SEM) using SmartPLS 4.0. This process consists of three stages as shown in the following figure.

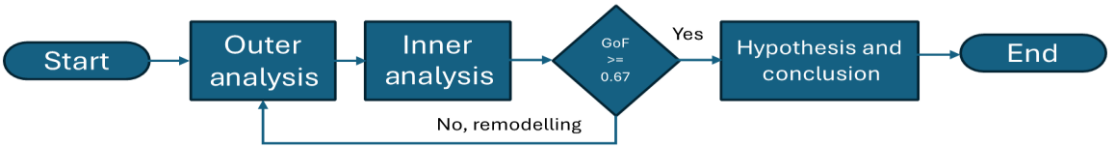

Figure 2. Research methodology.

In Figure 2, the first stage is outer analysis. At this stage, a conceptual model is constructed and drawn in Smart PLS 4.0 where its indicators are tested to determine whether they are valid. At this stage, two types of validity must be tested: convergent validity with the required outer loading above 0.7 and Average Variance Extracted (AVE) above 0.5.

The other is discriminant validity with a Fornell-Larcker criterion value above 0.7. In addition to validity, a reliability test was conducted. There are two types of reliability. The first is composite reliability with a required value of 0.7 and the second is Cronbach's alpha with the required value being above 0.7 for all constructs (Hair et al., 2022).

The second stage was an internal analysis. At this stage, three measures were calculated to evaluate the fitness of the model. The determinant coefficient (R2) known as the in-sample predictive power with a required value above 0.75 is said to be substantial. The second is predictive relevance (Q2) known as out-of-sample predictive power with a required value above 0 which is said to have predictive relevance for endogenous constructs. The third is Goodness of Fit (GoF) as a measure to evaluate how integrated the model has a value above 0.67 to be said robust and accurate (Hair et al., 2022).

The third stage is hypothesis testing. Two measures were used in this stage. The first is a p-value with a required value under 0.05 for an alpha of 5% and the second is a t-test value using an alpha of 5% with a required value above 1.96 (Hair et al., 2022). After conducting the above procedure, the results were compared to gain insight from the collected and analyzed data.

4. RESULT AND DISCUSSION

According to government rule no. 7 in 2021, 39 large companies were contacted to evaluate the model as indicated in Table 1.

Table 1. Number of companies across sectors.

No	Sectors	No. of companies
1	Automotive	16
2	Agribusiness	1
3	Infrastructure and logistics	3
4	Property	1
5	Information technology	2
6	Financial services	7
7	Heavy equipment, mining, construction and energy	9
Total		39

From Table 1, 39 companies can be grouped into seven business lines: 1) automotive, 2) agribusiness, 3) infrastructure and logistics, 4) property, 5) information technology, 6) financial services and 7) heavy equipment, mining, construction and energy. Among these business lines, most companies were classified into the automotive

category and the least into the agribusiness category.

Among the 39 companies, 233 respondents with five or six respondents from each company were contacted to participate in this research. They were instructed to fill out a questionnaire containing 30 items to test the aforementioned hypothesis in the previous section using a five-point Likert scale ranging from 1 (very disagree) to 5 (very agree). This number is greater than the minimum required size of 150 as elaborated in the previous section. The characteristics of these respondents included sex identity, age, position, length of tenure and length of the current position.

The first characteristic is sex identity. Figure 3 shows that 82% of the respondents were male and 18% were female. This shows that most respondents were male.

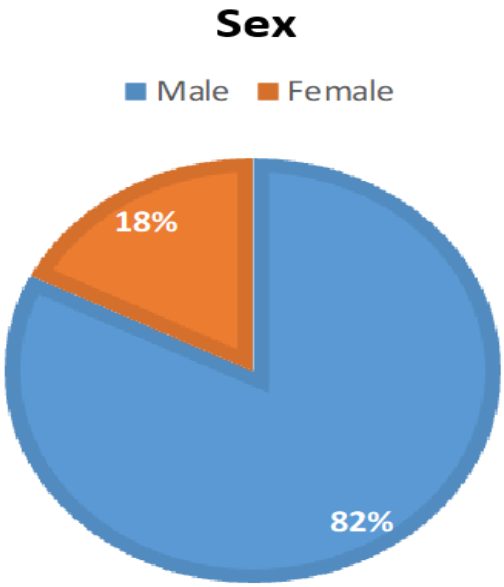

Figure 3. Respondent's sex identity.

The second most common characteristic was age. Figure 4 shows that most of the respondents were aged between 40 and 45 years and the least were aged above 55 years. This shows that most of the respondents were mature.

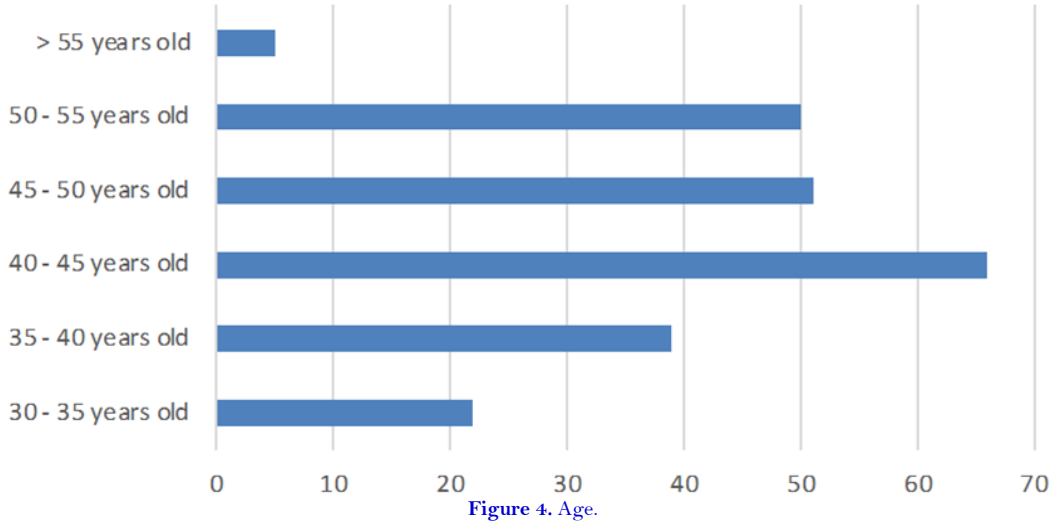

Figure 4. Age.

The third characteristic is position. Figure 5 shows that most respondents were in managerial positions while

the least were in directorial positions. This shows that most respondents are in managerial positions with knowledge related to innovation management in their representative companies.

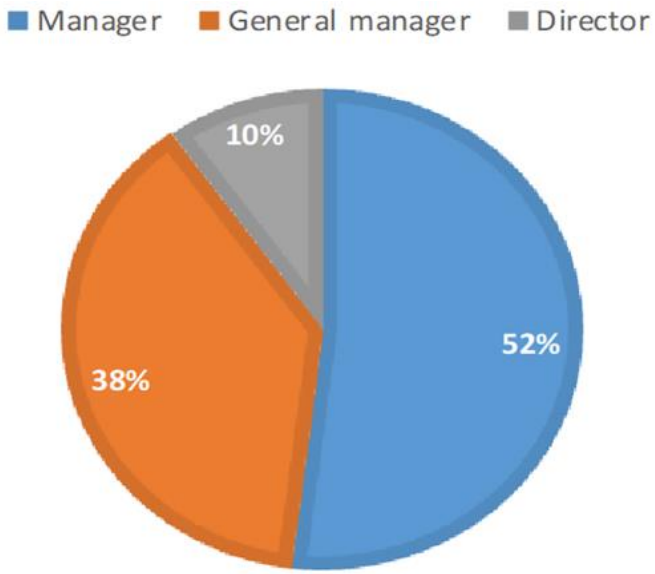

Figure 5. Position.

The fourth characteristic is tenure length. Figure 6 shows that most respondents were tenured for more than 21 years and the least tenured for less than a year. This shows that most respondents were well aware of the condition of their companies.

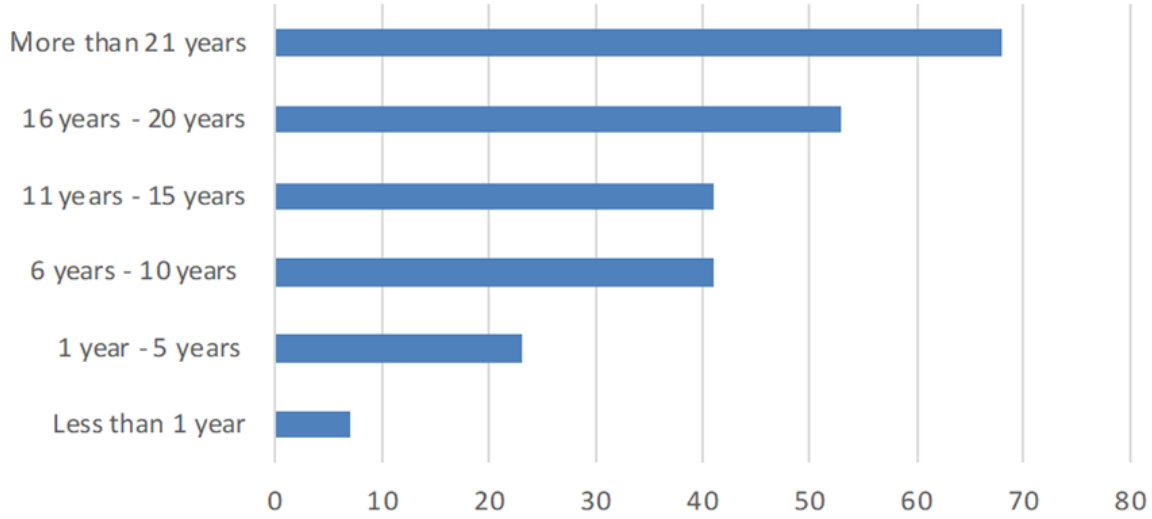

Figure 6. Length of tenure.

The fifth characteristic was the length of the current position. Figure 6 shows that most respondents have more than 21 years of tenure. This shows that most of the respondents were mature in their representative companies.

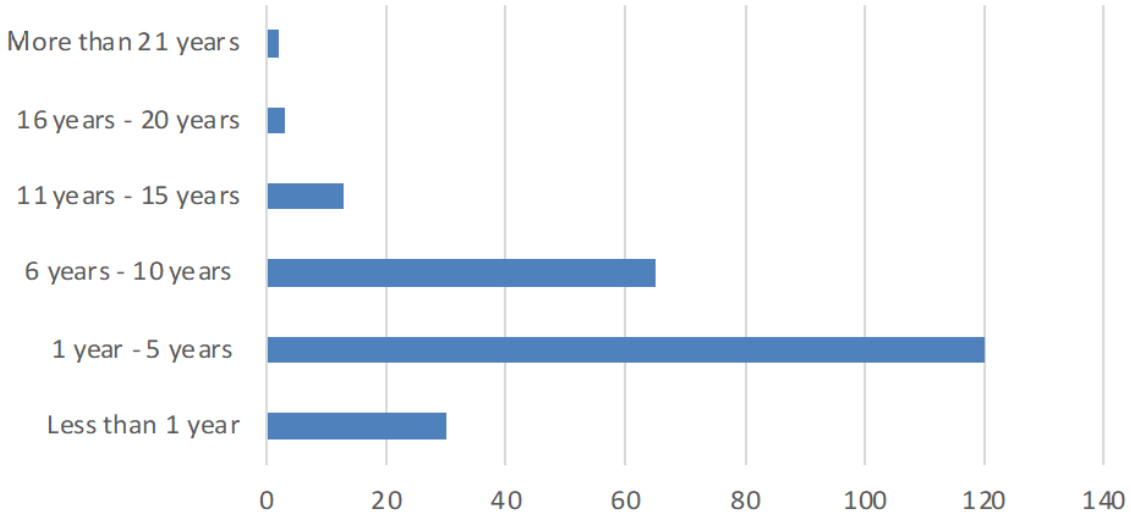

Figure 7. Length of holding the current position.

According to Figure 7, the majority of the respondents hold their current positions for one to five years. These characteristics provide a solid basis for the research to continue. The first stage of PLS-SEM after data collection is shown in Figure 8 to verify the validity and reliability of the collected data. For the validity test, convergent validity was conducted to check the validity of each relation between indicators and its construct using the outer loading value.

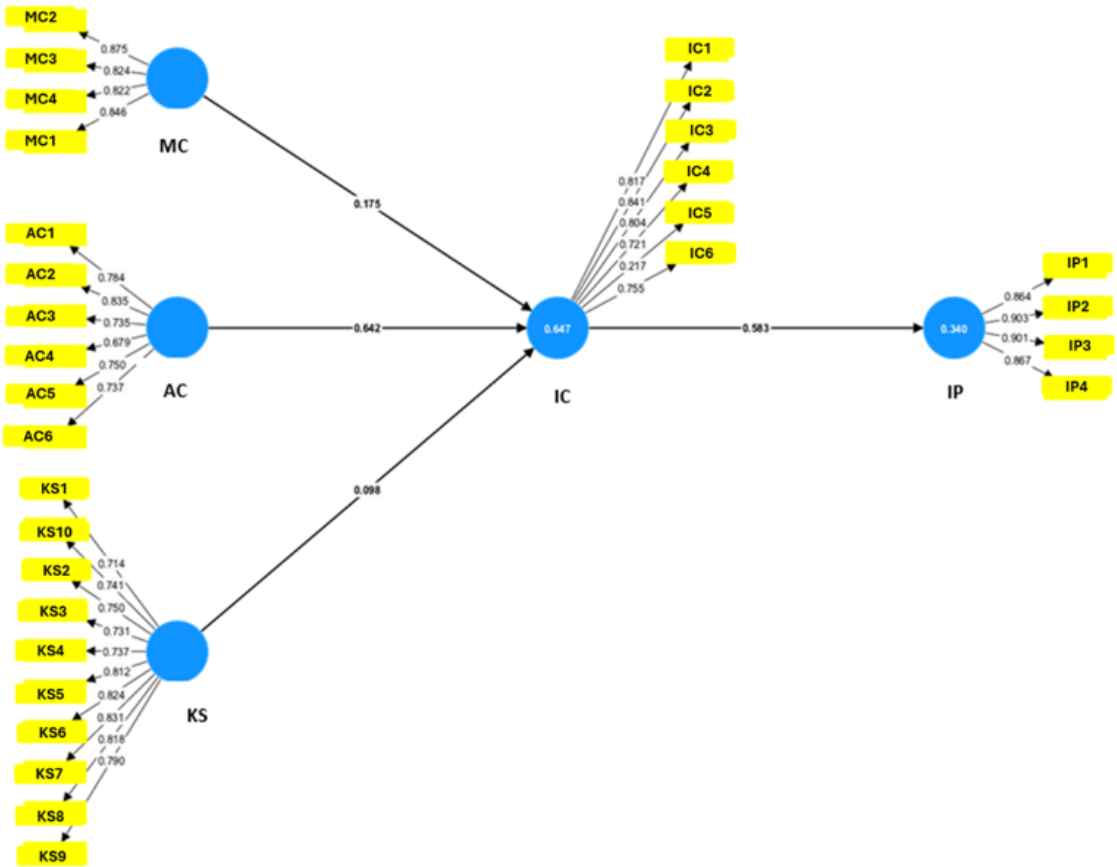

Figure 8. Outer loading (before).

According to Figure 8, only IC5 and AC4 of the questionnaire items are below the outer loading value of 0.7

(Hair et al., 2022). Thus, these two items were removed because they failed to meet the required convergent validity. From the questionnaires, the IC5 statement concerned whether the innovation was perceived as too risky in the company and whether there was resistance while the AC4 statement concerned whether one of the respondent's strengths was the ability to monitor, influence and lead others.

Bootstrapping was conducted at a level of 500 for the adjusted model. After removal, all remaining indicators require an outer loading value of 0.7 (Hair et al., 2022). Thus, they are said to have convergent validity as shown in Figure 9.

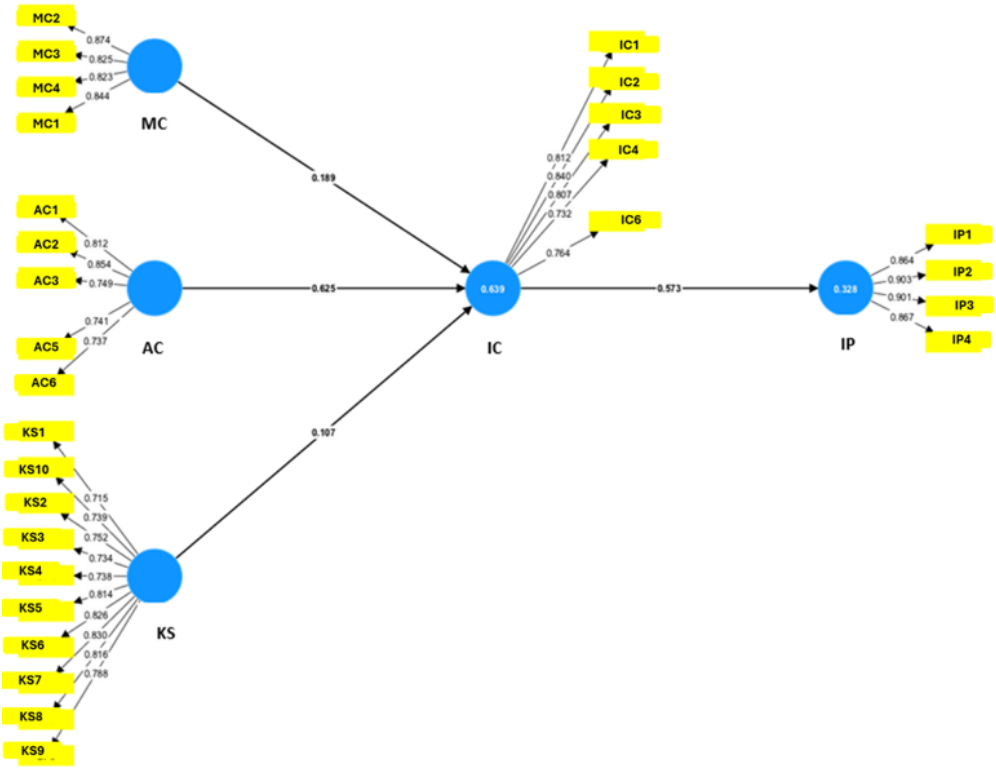

Figure 9. Outer loading (after).

Then, convergent validity is again tested using Average Variance Extracted (AVE) to determine whether each relationship between the indicators and their constructs is valid. Table 2 presents the AVE values.

Table 2. Average variance extracted (AVE).

Latent variables	
Adhocracy culture (AC)	0.609
Knowledge sharing (KS)	0.602
Innovation capabilities (IC)	0.627
Innovation performance (IP)	0.781
Knowledge sharing (KS)	0.708

From the table, the AVE values for all constructs are above the required 0.5 value meaning that more than half of the construct variance is explained by its indicators with an average AVE of 0.665.

Discriminant validity was tested using the Fornell-Larcker criterion to ensure that every concept of each construct is shown in Table 3 having confirmed convergent validity by outer loading and AVE.

Table 3. Fornell-Larcker criterion.

Latent variables	AC	KS	IC	IP	MC
Adhocracy culture (AC)	0.780				
Knowledge sharing (KS)	0.383	0.776			
Innovation capabilities (IC)	0.771	0.435	0.792		
Innovation performance (IP)	0.505	0.333	0.573	0.884	
Knowledge sharing (KS)	0.551	0.468	0.584	0.377	0.842

According to Table 3, the square root AVE of each construct is larger than that of the other constructs. Thus, it has discriminant validity in that all questions are unique in measuring the intended construct.

After verifying that the model is valid, the next step was to assess the model's reliability. It was conducted using composite reliability and Cronbach's alpha to measure the bottom limit of the construct's reliability while composite reliability measures the fair reliability value of the construct. Table 4 presents the measures.

Table 4. Cronbach's alpha and composite reliability.

Latent variables	Cronbach's alpha	Composite reliability (rho..a)	Composite reliability (rho..c)
Adhocracy culture (AC)	0.838	0.843	0.886
Knowledge sharing (KS)	0.926	0.930	0.938
Innovation capabilities (IC)	0.850	0.852	0.893
Innovation performance (IP)	0.907	0.908	0.935
Knowledge sharing (KS)	0.863	0.864	0.907

From the table, both the composite reliability and Cronbach's alpha values are above the required value of 0.70. Thus, these five constructs have high internal consistency reliability.

In the second stage, the inner analysis was confirmed to be valid and reliable. The determinant coefficient R^2 (in-sample predictive power) for IC = 0.639 (> 0.5 as moderate) and KI = 0.328 (>0.25, weak) has an average R^2 of 0.4835. Thus, Q2 and GoF are calculated as follows: Q2 = 1 − ((1-0.639)*(1-0.328)) = 1–(0.361*0.672)=1-0.243 = 0.757>0, indicating that the model has predictive relevance. GoF = sqrt (0.665 × 0.4835) = Sqrt (0.322) = 0.567> 0.38 which is considered a large GoF indicating that the model is robust. The testing parameters from the outer and inner analyses show that the model passed all the required statistical requirements. Thus, the model can be said to be valid, reliable and robust. Finally, hypothesis testing was conducted using Smart PLS as shown in Table 5.

Table 5. Hypothesis testing results.

Path	Original sample (O)	Sample mean (M)	Std. deviation (STDEV)	T-statistics (|O/STDEV|)	P-values
AC > IC	0.625	0.624	0.056	11.231	0.000
KS > IC	0.107	0.115	0.050	2.142	0.033
IC > IP	0.573	0.574	0.047	12.184	0.000
MC > IC	0.189	0.186	0.060	3.139	0.002

The hypothesis testing results show that H1) MC on IC is significantly related (t =3,139, p-value< 0.05), H2) AC on IC is significantly related (t =11,231, p-value< 0.05), H3) KS on IC is significantly related (t =2,142, p-value< 0.05) and H4) IC on IP is significantly related (t =12,184, p-value< 0.05).

From the above figure, it can be concluded that 1) MC on IC has a correlation value of r = 0.189 or very weak (r < 0.21), 2) AC on IC has a correlation value of r = 0.625 or strong (0.61< r <0.80), 3) KS on IC has a correlation value of r = 0.107 or very weak (r < 0.21) and 4) IC on IP has a correlation value of r = 0.573 or moderate (0.41< r < 0.60).

It can be understood that most IC are influenced by MC, KS and AC and partly by other factors while KI is

partly influenced by KAI and other factors. The table shows that MC (r=0,189), AC (r=0,625) and KS (r=0,107) are the three factors required by a company to develop its innovation capabilities.

AC is the dominant factor among these factors compared to others in developing IC with r = 0.625 and a strong relationship. MC and KS factors mutually impact IC but they are not as powerful as AC in pushing IC with r = 0.189 and r = 0,107 or they have a very weak relationship (r < 0.21).

Next, an F-statistic test was conducted. From the previous calculation, it is known that the average R square was 0.485 with a degree of freedom (k) of 3 which includes managerial capabilities, adhocracy culture and knowledge sharing. The sample total (n) used was 233, the significance level used was (a) 5% and the F-value was calculated using the following formula (Hamonangan, Marzuki, & Surbakti, 2021):

$$f = \frac{R^2(n-k-1)}{k(1-R^2)} \quad \text{.....1}$$

Calculated F = 0.4835 (233-3-1)/ 3(1-0.4835).

Calculated F = (0.4835*229)/ 1.5495.

Calculated F = 110.7215/1.5495

Calculated F = 71.4563.

Then, the F table value is found using a significance level of 5% as follows:

F table = F-a (k, n-k-1).

= F0, 05 (3,233-3-1).

= F0, 05 (3,229).

= 2.6440 (derived from the F table).

From the above calculation, the calculated F value > F table value which is 71. 4563 > 2.6440 means that managerial capabilities, adhocracy culture and knowledge sharing simultaneously impact and contribute to innovation capabilities and performance at a value of 48.35% (average R square).

This research has significant findings where the main IC pusher is AC which can be strengthened by MC and KS factors. In other words, MC and KS are not sufficient to build an IC if AC is not formed. Thus, ensuring that innovation becomes a culture is very important for developing a company's IC. This research strengthens the findings of previous studies such as Iddris (2016) and Kyrgidou and Spyropoulou (2013). Lin (2007), Mendoza-Silva (2021) and Yeşil, Büyükbeşe, and Koska (2013) where novelty is gained in those three factors such as managerial capabilities, adhocracy culture and knowledge sharing have empirically proven to be integrated as a model to empirically advocate innovation capabilities that can also increase the innovation performance of the company.

5. CONCLUSION

As a theoretical contribution, the factors empirically proven to impact both innovation capabilities and performance are managerial capabilities, adhocracy culture and knowledge sharing. These factors were identified in previous studies. This research was conducted in large companies in the Astra Group with respondents holding managerial positions in the companies.

The managerial implications of these empirical findings show that innovation performance can be driven by innovation capabilities that require three factors: managerial capabilities, adhocracy culture and knowledge sharing.

Improvement recommendations from managerial aspects cover strengthening managerial capabilities, adhocracy culture and knowledge sharing so that innovation capabilities can be built and innovation performance can be improved by the company.

Contributions and suggestions to strengthen innovation practices for Indonesian companies include paying

attention to managerial capabilities, adhocracy culture and knowledge sharing to develop innovation capabilities that can increase a company's innovation performance.

The limitation of this research is related to its limited objects and sample sizes where factors only cover managerial capabilities, adhocracy culture and knowledge sharing on innovation capabilities and performance in large companies in Indonesia.

Therefore, it is suggested that for future research, the design can be expanded to cover small and medium enterprises to better understand the impact of those factors on both innovation capabilities and performance and help more industrial practitioners encourage the innovation spirit and movement which can provide sustainable benefits for organizations and companies.

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Institutional Review Board Statement: The Ethical Committee of the Universitas Tarumanagara Indonesia has granted approval for this study on 20 December 2022 (Ref. No. 009-UTHREC/UNTAR/XII/2022).
Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Competing Interests: The authors declare that they have no competing interests.
Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.

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APPENDIX: 30 item-questionnaire.

Appendix present 30 item-questionnaire covering variables and indicators of the research.

A. Managerial Capabilities (MC): The roles and ability of leaders in the company to support innovation capabilities.

(Five-point Likert scale, adapted from Kyrgidou and Spyropoulou (2013).

MC1. One of our greatest strengths is achieving results by organizing and motivating people.

MC2. One of our greatest strengths is organizing resources and coordinating tasks.

MC3. One of our greatest strengths is the ability to delegate effectively.

MC4. One of our greatest strengths is the ability to supervise, influence and lead people.

B. Adhocracy Culture (AC): The culture implementation in the company, especially adhocracy culture, focuses on creativity, entrepreneurship, and risk-taking to support innovation capabilities in the company.

(Five-point Likert scale, adapted from Leal-Rodríguez, Eldridge, Ariza-Montes, and Morales-Fernández (2019)).

AC1: My organization is a dynamic and entrepreneurial entity. People bet on their ideas and take risks.

AC2: Leadership is characterized by fostering entrepreneurship, innovation, and risk assumptions.

AC3: The management promotes individual initiative, risk-taking, innovation, and uniqueness.

AC4: The values shared are the commitment to innovation, development, and continuous change.

AC5: The strategic priorities are the acquisition of new resources and the creation of new challenges

AC6: Success criteria are based on the development of unique and novelty products or services.

C. Knowledge Sharing (KS): The implementation of a knowledge management process, especially in terms of sharing knowledge to support innovation capabilities in a company.

(Five-point Likert scale, adapted from Van Den Hooff and Ridder (2004))

KS1: When I've learned something new, I see to it that colleagues in my department can learn it as well.

KS2: I share the information I have with colleagues within my department.

KS3: I share my skills with colleagues within my department.

KS4: When I've learned something new, I see that colleagues outside of my department can learn it as well.

KS5: I share the information I have with colleagues outside of my department.

KS6: I share my skills with colleagues outside of my department.

KS7: Colleagues within my department tell me what they know when I ask them about it.

KS8: Colleagues within my department tell me what their skills are when I ask them about it

KS9: Colleagues outside of my department tell me what they know when I ask them about it.

KS10: Colleagues outside of my department tell me what their skills are, when I ask them about it.

D. Innovation Capabilities (IC): The activity, implementation, and innovation capability of a company.

(Five-point Likert scale, adapted from Lin (2007).

IC1: Our company frequently tries out new ideas.

IC2: Our company seeks new ways of doing things.

IC3: Our company is creative in its operating methods.

IC4: Our company is frequently the first to market new products and services.

IC5: Innovation is perceived as too risky in our company and is resisted (reversed coded).

IC6: Our new product introduction has increased during the last five years.

E. Innovation Performance (IP): The implementation and innovation capability of the company to support innovation performance in the company.

(Five-point Likert scale, adapted from Mir et al. (2016)

IP1: Number of innovative ideas registered.

IP2: Number of innovative projects launched.

IP3: Number of innovative projects ongoing.

IP4: Number of innovation projects completed.