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Organizational Agility, Digital Operation Capability, Top Management Support on Agricultural Ministry's Digital Innovation Performance

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ABSTRACT

The current digital economy requires public organizations to innovate. The question is how agricultural digital innovation performance can be influenced by organizational agility, digital operation capability, and top management support as moderating variables in both relationships. This study plays a role in providing empirical understanding of several factors that can enhance the success of digital transformation, particularly in the Ministry of Agriculture. The research method was conducted quantitatively through a survey using a Likert scale questionnaire administered to employees involved in the digitalization process at the Ministry of Agriculture. Using Partial Least Squares–Structural Equation Modeling (PLS-SEM) to analysis data. The analysis results show that organizational agility and digital operation capability have a significant positive effect on digital innovation performances. As a moderating variable, top management support strengthens and is significant in the relationship between organizational agility and digital innovation performance. However, it significantly weakens the relationship between digital operation capability and digital innovation performance. These findings provide information that adaptability and digital readiness, along with top management support, are able to support the success of digital innovation in the Ministry of Agriculture.

Keywords: *Digital Innovation Performance, Digital Operation Capability, Organizational Agility, Top Management Support.*

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1. | INTRODUCTION

The rapidly developing technological environment, combined with increasing citizen expectations, is driving government organizations to engage in digital transformation projects (Mergel et al., 2019). Digital transformation in the agricultural sector is the process of utilizing digital technology to improve productivity, efficiency, reduce the risk of crop failure, facilitate access to information and markets, enhance the competitiveness of agricultural products, engage the younger generation, and ensure sustainability in agricultural activities. The technologies used include digital technology, the Internet of Things (IoT), drones and satellite imagery, Artificial Intelligence (AI), mobile applications and digital platforms, big data, and precision agriculture systems for pest cultivation and agricultural product processing. Serious environmental challenges are caused by the digital economy, so the digitization process creates new potentials and solutions. (Cheng et al., 2024). The government often needs to adapt to changes in the social, political, and technological environment, and innovation is crucial for the government's ability to adapt to a changing environment (Janssen & Van Der Voort, 2016).

Digital technology is utilized as a method of training and learning for agricultural human resources, research and development, to expand the reach of education, applying traditional agriculture technology (Agriculture 2.0) to modern agriculture technology (Agriculture 3.0) with the target of Agriculture 4.0 technology by 2029. It also supports sustainable farming practices through technological innovations to increase productivity, efficiency, competitiveness in agriculture, and sustainable agriculture. Organizations in the public sector face increasing demands to leverage disruptive technology to create higher public value, amid ongoing various pressures (Mahroof et al., 2025). To realize this goal, digital transformation of public services within modern government is necessary to improve public access and elevate service quality, especially in the agricultural sector. However, many public organizations struggle to adapt to digital transformation (Moser-Plautz & Schmidthuber, 2023).

Digital transformation is influenced by several critical factors, such as infrastructure, organizational culture, connectivity, inter-agency synergy, and managerial support (Osmundsen et al., 2018; Vogelsang et al., 2018). The essential point is that digital culture reflects the extent to which an organization can operate with agility and responsiveness (Shin et al., 2023). Agility is an organizational ideology that uses business processes to support sustainable performance by focusing on people, conducting regular evaluations, and emphasizing learning based on work outcomes. (Mergel et al., 2019). Digital capabilities enable companies to redefine people, objects, and processes, as well as drive corporate value creation (Vial, 2019). Moreover, digital transformation requires the integration of organizational culture, human resources, structural arrangements, functional roles, and digital strategy, in addition to adopting more sophisticated technologies in an increasingly dynamic digital environment (Alakaş, 2024). Top management must be capable of acting swiftly and cultivating an appropriate organizational culture to achieve optimal performance.

Based on these ideas, this study aims to explore the role of organizational agility and digital operational capabilities in enhancing digital innovation performance at the Ministry of Agriculture, with support from top management as a mediating variable (Zhang et al., 2024). Using a quantitative approach, data were collected through surveys employing Likert-scale

questionnaires distributed to civil servants involved in digitization projects at the Ministry of Agriculture. The data were then analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM) to test the proposed theories by evaluating how well the model predicts the covariance matrix of the sample data through multiple regression analysis (Hair et al., 2014). Specifically, this research seeks to answer the following question:

H1: How does Organizational Agility affect Digital Innovation Performance in the Ministry of Agriculture?
H2: How does Digital Operation Capability affect Digital Innovation Performance in the Ministry of Agriculture?
H3: Top Management Support positively moderates the relationship between organizational agility and digital innovation outcomes.
H4: Top Management Support positively moderates the relationship between digital operational capabilities and digital innovation outcomes?

2. | LITERATURE REVIEW

Organizational Agility

Organizational agility refers to a strategic capability that enables firms to respond to environmental changes swiftly, accurately, and efficiently by increasing operational flexibility, adapting internal processes, and making informed decisions based on available information (Zhen et al., 2021; Tallon et al., 2019). Organizational agility in the public sector reflects a government's ability to adapt to societal changes and evolving community needs by innovating in the delivery of public services (Almazrouei et al., 2024; Mergel, 2023). Agility is an important prerequisite for the Ministry of Agriculture to strengthen digital innovation performance through the integration of digital operation capability, which ensures technology based operational efficiency, as well as management support that plays a role in providing strategic guidance, fostering an adaptive culture, and facilitating collaborative decision making.

Digital Operational Capability

Exploration and utilization of digital capabilities are strategic elements in enhancing digital innovation performance, particularly online informational capabilities. The generative nature of digital technology enables it to flexibly adapt to changes in an organization's internal and external environments (Hanelt et al., 2021). In the Ministry of Agriculture, leveraging data as a primary production resource promotes the development of efficient and adaptive operating systems (Ming & Kamaruddin, 2025). This approach accelerates decision making processes, optimizes resource allocation, and strengthens organizational agility in facing changes. With an integrated system, services can be delivered to the public more quickly, accurately, and responsively, thereby enhancing the quality of human resources and improving public welfare.

Top Management Support

The confidence and dedication of senior leaders in implementing digital technology to boost organizational performance are manifested through the support provided by top management (Liang et al., 2007; Ding et al., Shao et al., 2016). The role of top management becomes very crucial because the digital strategy implemented affects all organizational units

and has the potential to generate internal resistance (Vial, 2019; Vogelsang et al., 2018). This support is not only manifested through the provision of funds and resources necessary for the innovation and transformation process (Cooper & Edgett, 2004), but also through facilitating cross-departmental communication and establishing synergies among units to create a shared vision in the implementation of digital innovation. In addition, top management support includes commitment, active participation, as well as granting authority and power to the implementing team to ensure the success of digital projects within the Ministry of Agriculture (Islam et al., 2009; Tam et al., 2020). Several factors determine the success of digital innovation, such as the development of human resource quality in the apparatus, regulatory improvements, precise program targeting, and support across sectors. Improving digital public services requires top management to have the capability to develop and adjust strategic policies effectively. The key characteristics of effective management include planning, organizing, leading, and optimizing resources to accomplish organizational goals.

Digital Innovation Performance

Digital innovation performance refers to an organization's ability to generate and implement substantial innovations both in quantity and quality through the effective use of digital technologies. Digitalization enhances innovation capability not only through the direct use of technology but also by strengthening supporting factors such as knowledge flows, the transfer of technical expertise, investment in research and development, and innovation awareness (Chen et al., 2023). Within organizational contexts, the study suggests that digital transformation yields greater benefits for private firms and organizations operating in non–high-tech sectors, reducing innovation gaps. Additionally, at the individual level, it explains that transformational leadership drives employee work behavior innovation, which in turn supports digital adoption and enhances job performance through a sequential mediation process (Jain & Sharma, 2025). The purpose of technological innovation is to enable stakeholders to access, comprehend, and implement agricultural technologies developed in farming activities. This approach improves efficiency and competitiveness while ensuring the technology is truly adopted. Moreover, it plays a role in all stages of implementing the Gender Mainstreaming Strategy (GMS), including planning, budgeting, monitoring, evaluation, reporting, and conducting oversight and audits.

3. | RESEARCH METHOD

The quantitative research method is a systematic scientific approach to testing theories through the numerical measurement of variables and statistical analysis (Sugiyono, 2020; Sekaran & Bougie, 2016). This approach is deductive, starting from the formulation of hypotheses, operationalization of variables into measurable indicators, designing instruments such as Likert scale questionnaires, to selecting a representative sample and analyzing data to test the relationships between variables. Its advantage lies in its ability to produce generalizations and objectively measure relationships, although it has limitations in understanding qualitative context and addressing exploratory questions. Ferdinand (2014), in quantitative research, in-depth analysis can be conducted using Structural Equation Modeling (SEM), either covariance-based (CB-SEM) or Partial Least Squares (PLS-SEM). These approaches enable the simultaneous testing of both measurement and structural models. The choice between them depends on the research objectives, sample size, and data distribution assumptions. The analytical process typically includes model specification, parameter

estimation, assessment of reliability and validity, and interpretation of the results. This research model has a small to medium sample size, it more appropriate to use PLS-SEM (Zhang et al., 2024).

To ensure the quality of the research findings, aspects of validity, reliability, and the fulfillment of statistical assumptions must be carefully maintained. At the same time, the use of a cross-sectional design requires caution, as it carries inherent limitations in establishing strong causal inferences. The methodology section typically includes several important components.

The sampling component describes the research population, which consists of civil servants (ASN) working in various Work Units within the Ministry of Agriculture. Respondents were required to meet two criteria: having worked for at least one year in the relevant Work Unit, and being willing to complete the questionnaire and provide informed consent. A purposive sampling technique was used to ensure the selection of respondents who were directly relevant to the research context.

The data collection process was carried out using a questionnaire measured on a 1–5 Likert scale, where 1 represented "Strongly Disagree" and 5 represented "Strongly Agree." Both the measurement model and structural model were analyzed using Partial Least Squares–Structural Equation Modeling (PLS-SEM). This method was selected due to its flexibility regarding data distribution assumptions, its capacity to accommodate models with numerous indicators and medium-sized samples, and its suitability for examining causal relationships in survey-based research within the context of public sector organizations.

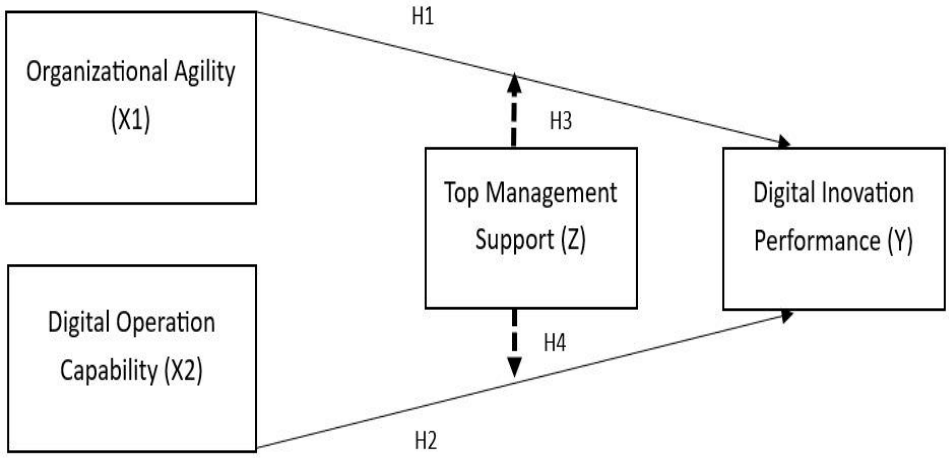

Figure 1. Conceptual Model

4. | RESULTS

The Ministry of Agriculture's headquarters is located in South Jakarta Indonesia. This in 2025, the Ministry of Agriculture had a total of 10,185 civil servants distributed across several Work Units in 10 Echelon 1 units throughout Indonesia. The questionnaire was distributed via the Whatsapp application directly to civil servants or to work groups in several Work Units within the Ministry of Agriculture. Within 6 days, a total of 128 responses were received, with 126 of the questionnaires being valid.

Table 1. Respondents Profile

Respondent	Total	Information
Civil servant	128	Responses
	126	Valid
	2	Invalid 1: different institution 1: double entry
Length of employment	126	100%
1–5 years	54	42,9%
6–10 years	20	15,9%
11–15 years	11	8,7%
16–20 years	21	16,7%
21–25 years	8	6,3%
26–30 years	12	9,5%

Measurement Model

The outer model, or measurement model, evaluates how indicator variables relate to and reflect their associated constructs (Hair et al., 2014).

Table 2. Measurement Model

Variable / Items	Mean	SD	Loadings	Cronbach's Alpha	CR	AVE
DIP						
DIP1	4.278	0.697	0.771			
DIP2	4.238	0.739	0.791			
DIP3	4.333	0.642	0.810	0.821	0.822	0.584
DIP4	4.286	0.677	0.736			
DIP5	4.365	0.730	0.708			
DOC						
DOC1	4.405	0.747	0.776			
DOC2	4.325	0.688	0.816	0.730	0.733	0.649
DOC3	4.381	0.688	0.825			
OA						
OA1	4.349	0.682	0.759			
OA2	4.421	0.634	0.785			
OA3	4.476	0.600	0.788	0.864	0.866	0.596
OA4	4.397	0.656	0.753			
OA5	4.460	0.626	0.775			
OA6	4.437	0.624	0.771			
TMS						
TMS1	4.460	0.686	0.818			
TMS2	4.556	0.649	0.794			
TMS3	4.421	0.728	0.785	0.856	0.858	0.634
TMS4	4.500	0.721	0.825			
TMS5	4.421	0.717	0.758			

The outer loading values for all indicators exceed the recommended minimum of 0.70, as presented in Table 2, demonstrating adequate indicator reliability. Validity was evaluated through convergent and discriminant validity. According to Hair et al. (2014), outer loadings should not fall below 0.70, and the average variance extracted (AVE) should meet or exceed 0.50.

Table 3. Discriminant Validity

Items	DIP	DOC	OA	TMS
DIP1	0,771	0,642	0,514	0,657
DIP2	0,791	0,597	0,559	0,680
DIP3	0,810	0,654	0,539	0,620
DIP4	0,736	0,580	0,421	0,572
DIP5	0,708	0,617	0,622	0,642
DOC1	0,612	0,776	0,605	0,569
DOC2	0,652	0,816	0,581	0,562
DOC3	0,691	0,825	0,578	0,591
OA1	0,506	0,512	0,759	0,430
OA2	0,495	0,495	0,785	0,542
OA3	0,590	0,563	0,788	0,593
OA4	0,556	0,612	0,753	0,501
OA5	0,506	0,617	0,775	0,511
OA6	0,565	0,564	0,771	0,547
TMS1	0,660	0,585	0,510	0,818
TMS2	0,659	0,595	0,571	0,794
TMS3	0,667	0,576	0,504	0,785
TMS4	0,712	0,588	0,591	0,825
TMS5	0,613	0,488	0,518	0,758

Table 3 shows that discriminant validity is strictly confirmed by the measurement model and this is acceptable due to its reliability and validity (should >0.70). The cross-loading approach is used to test discriminant validity (Ravand & Baghaei, 2016).

Structural Model and Hypothesis Testing

Table 4. Collinearity Statistics

Items	VIF	Items	VIF
DIP1	1,714	DOC1	1,377
DIP2	1,751	DOC2	1,485
DIP3	1,900	DOC3	1,472
DIP4	1,574	TMS1	2,003
DIP5	1,495	TMS2	1,819
OA1	1,959	TMS3	1,836
OA2	2,053	TMS4	2,031
OA3	1,832	TMS5	1,733
OA4	1,675	-	-
OA5	1,961	-	-
OA6	1,934	-	-

The first step before testing the structural model is to evaluate its collinearity using the variance inflation factor (VIF), with the condition that the VIF value approaches 3 but does not exceed it (Hair et al., 2019). Table 4 shows that the collinearity values are quite good.

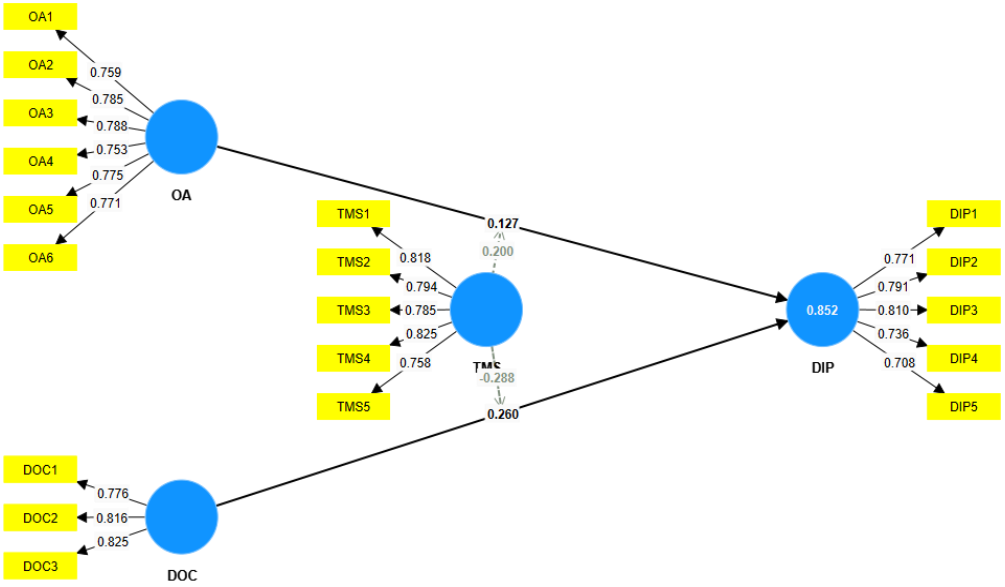

Figure 2. Structure Model Analysis

Based on the results of the structural equation model in the Figure 2, the value of R^2 is 0.852. This means that 85.2% of the variation in the dependen variable Digital Innovation Performance can be explained by the independent variables, Organizational Agility, Digital Operation Capability, and Top Management Support as a moderator. The remaining 0.148 or 14.8% is influenced by variables outside of this research model.

Figure 5. Structure Model Analysis

Analysis	Saturated Model	Estimated Model
SRMR	0,070	0,076
NFI	0,776	0,779

Then conduct an analysis of the standardized root mean square residual (SRMR) and normed fit index (NFI). It indicates a good fit if the value is below 0.08 (Henseler et al., 2014; Hu & Bentler, 1999), while the NFI value should be between 0 and 1. The closer to 1, the better the fit. Based on Table 5, it is known that the fit is quite good.

Figure 6. Structure Model Analysis

Hipothesis	β	SD	T statistics	P-values
OA -> DIP (H1)	0.127	0.060	2.099	0.036
DOC -> DIP (H2)	0.260	0.071	3.649	0.000
TMS x OA -> DIP (H3)	0.200	0.096	2.089	0.037
TMS x DOC -> DIP (H4)	-0.288	0.099	2.915	0.004

We will use a significance level of $\alpha = 0.05$ (5%), which means we compare the P-value with 0.05. The hypothesis result in Table 6, H1, OA variable has a positive and significant

effect on DIP, it has a P-value of 0.036 (< 0.05) and a β coefficient of 0.127, this is indicating a positive effect. H2, DOC variable has a positive and highly significant effect on DIP, as the P-value is 0.000 (0.05) and the β coefficient of 0.260 indicates a stronger positive effect than OA. The results of the H3, TMS positively and significantly moderates the relationship between OA and DIP, as the P-value is 0.037 (0.05) and the interaction coefficient β = 0.200 indicates that TMS strengthens the positive relationship of OA on DIP. The results of the H4, TMS negatively and significantly moderates the relationship between DOC and DIP, because the P-value of 0.004 (0.05) and the interaction coefficient β=-0.288 indicate that TMS weakens the positive relationship between DOC and DIP.

5. | DISCUSSION

This study focuses on analyzing the relationship between organizational agility, digital operational capabilities, and digital innovation performance at the Ministry of Agriculture, taking into account the moderating effect of top management support. Structural model analysis shows that all research hypotheses are significantly supported. These findings are in line with the research of Zhang et al. (2024), which emphasizes that organizational agility and digital capabilities significantly contribute to the success of an organization's digital transformation.

Based on the results of the hypothesis test, it was found that OA has a positive and significant effect on DIP. These results are consistent with previous studies showing that organizational agility enables institutions to respond quickly, flexibly, and efficiently to environmental changes, thereby fostering innovation (Zhen et al., 2021; Tallon et al., 2019). The Ministry of Agriculture is currently considered capable of quickly adapting in providing digital services according to needs, formulating effective policies, overcoming emerging challenges, and continuously improving technology. The formulation of targeted, flexible, compliance-oriented, and principle-based regulations is crucial in an era marked by increasing societal complexity. One approach to improving regulatory quality is through the systematic simplification of regulations.

Furthermore, DOC has been proven to have a positive and significant impact on DIP. This reinforces the argument that digital operational capabilities, which include the use of digital technology to optimize business processes, data analysis, and decision-making, are key factors in generating innovation value (Hanelt et al., 2021; Li Ming et al., 2025). Enhanced budget oversight, more efficient development planning, and evidence-based policymaking all require integrated and interoperable data across government agencies. The Ministry of Agriculture is able to utilize technology to optimize services and business processes, particularly to support sustainable agriculture. In addition, technology is used as a strategic asset for analytical tools to enhance the effectiveness of decision-making.

TMS as a moderating variable also shows significant results. TMS strengthens the connection between OA and DIP. This shows that the commitment and involvement of leaders in providing resources, giving strategic direction, valuing ideas and suggestions positively, and building an adaptive culture influence digital innovation towards modern agriculture. These results align with studies highlighting the role of TMS in driving digital transformation through resource allocation and collaboration support (Liang et al., 2007; Cooper & Edgett, 2004).

TMS actually weakens the relationship between DOC and DIP. This means that in a complex bureaucratic environment, top management support that is too centralized or not

aligned with operational needs can prevent digital capabilities from functioning optimally. Top management that is unwilling to participate in setting goals, commitments, and providing resources in the transformation process will hinder the digitalization process itself. According to previous research resistance or internal rejection may arise when digital strategies are implemented without participatory involvement from relevant parties (Vial, 2019; Vogelsang et al., 2018).

This research proves that support from top management can strengthen the relationship between organizational agility and digital innovation performance. However, it also notes that such support can cause problems if not accompanied by a flexible approach and is too authoritarian. The Ministry of Agriculture needs to accelerate the development and consolidation of information centers along with their supporting ecosystems; strengthen digital competencies within the workforce and promote the application of research findings; advance digital sovereignty through enhanced security and personal data protection; and cultivate a conducive digital environment. Furthermore, the Ministry must establish and develop management systems that can foster a robust digital ecosystem benefiting both the business sector and governmental institutions. In addition to supplying technology, the government and the private sector must undertake various efforts to establish and maintain a sustainable agricultural ecosystem. These efforts include providing financial support and advancing downstream processing of environmentally friendly agricultural products. Moreover, Internet of Things (IoT) technologies can optimize water usage and reduce input requirements in agricultural cultivation, ultimately enhancing productivity.

6. | CONCLUSION

This study has an important limitation related to its use of a cross-sectional design, which does not allow for the tracking of changes over time. Another limitation is the restricted scope, as the research was conducted within only one government institution. Several recommendations can be proposed for future research. One direction is to employ a longitudinal design to verify causal relationships between variables across different time periods. Another possibility is to examine mediation mechanisms such as Bureaucratic Inertia or Regulatory Barriers to provide deeper insight into why TMS weakens the relationship between DOC and DIP. Future studies may also replicate this model in other government institutions to uncover different results and compare the moderating effects of TMS across various organizational settings.

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Conflict of Interest Statement

The authors declare that there is no conflict of interest.

Ethical Approval and Originality Statement

Ethical approval was obtained for this study. The manuscript represents original work and has not been previously published, nor is it under consideration by another journal.

Data Disclosure Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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