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# Causal factors of digital transformation Adoption affecting the personnel competency Of higher education institutions in thailand

**[1]Phakphum Arttakonsiripo,[2]Ungul Laptaned**

[1]Doctor of Business Administration Program, Graduate College of Management, Sripatum University, Bangkok, Thailand
[2]Graduate College of Management, Sripatum University, Bangkok, Thailand

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**Abstract**

This article aimed 1) to study the causal factors affecting digital transformation adoption and personnel competency of higher education institutions in Thailand, 2) to study the influence of causal factors of digital transformation adoption affecting personnel competency of higher education institutions in Thailand, and 3) to develop a model the causal factors of digital transformation adoption affecting personnel competency of higher education institutions in Thailand. A researcher collected data from interviews and online questionnaires with representatives of higher education institutions in Thailand, from April 2024 to June 2024 by collecting a sample of 420 people. The results of the analysis concluded that cultural environment affected digital transformation adoption, cultural environment affected personnel competency through digital transformation adoption, organizational structure affect digital transformation adoption, organizational structure affected personnel competency through digital transformation adoption, open source AI adoption affected on digital transformation adoption, open source AI adoption affected personnel competency through digital transformation adoption, and digital transformation adoption affected personnel competency. The institution will be able to assess the potential long-term and short-term impacts before deciding to implement new digital technologies.

**Keywords:** Cultural Environment, Organizational Structure, Open Source AI Adoption, Digital transformation adoption, Personnel Competency

## 1. Introduction

The digital transformation has created new opportunities and challenges for delivering quality education. The integration of technology into teaching, knowledge management, and access to learning resources has become essential. As a result, higher education institutions must improve their curricula, teaching methods, and management structures to meet these demands. In Thailand, the implementation of digital transformation in higher education is a critical issue that impacts the growth and sustainability of organizations.

Challenges may arise from difficulties in adapting to digital changes, a lack of digital knowledge and skills among relevant personnel, limitations in technology and inadequate facilities for digital development, as well as inappropriate management approaches and business strategies that fail to maximize the benefits of digital technology. This has led researchers to explore how the concept of digital transformation can help Thai higher education institutions enhance their adaptability to technological changes and societal transformations.

Related research by Garrido (2012), Tungpantong et al. (2012), and Aguilera (2018) informs this study. The researcher collected data from representatives of higher education institutions in Thailand, categorizing them as follows: 1) limited public universities, 2) unlimited public universities, 3) state-controlled universities, 4) Rajabhat universities, 5) Rajamangala University of Technology, 6) private universities, 7) private colleges, 8) private institutes, and 9) non-higher education institutions. Data was gathered through interviews and online questionnaires from representatives between April and June 2024.

The qualitative population consisted of representatives from the categorized higher education institutions, with a sample size of 9. The quantitative population comprised 420 representatives, calculated using structural equation modeling techniques.

Expected benefits include helping representatives from higher education institutions in Thailand plan and drive digital development effectively. This research could facilitate efficient digital advancement in Thai higher education by providing quality insights into factors influencing digital transformation adoption, which can be used to formulate strategies and development plans that enable institutions to grow and gain recognition in the digital landscape.
This research article presents a study based on system theory, examining empirical variables that influence digital transformation adoption and personnel capability. The researcher believes that the findings will be significant for representatives of Thai higher education institutions, as well as for academic stakeholders like scholars, researchers, and students, who can use this empirical study to enhance integration and further academic pursuits.

**2. Research Objectives**

1) To study the causal factors affecting digital transformation adoption and personnel competency of higher education institutions in Thailand.
2) to study the influence of causal factors of digital transformation adoption affecting personnel competency of higher education institutions in Thailand.
3) To develop a model the causal factors of digital transformation adoption affecting personnel competency of higher education institutions in Thailand.

**3. Literature Review**

The concepts and theories used in the research encompass cultural environment, organizational structure, open source AI adoption, digital transformation adoption, and personnel capability. These are discussed in the background and significance of the problem, which serve as the variables for defining the conceptual framework. The consideration of the relationships between the variables is as follows:

**Hypothesis 1: The relationship between cultural environment and digital transformation adoption**

Gregory Vial (2019) found that it is a core concept that helps companies keep pace with mature and highly competitive markets, enabling them to fully adapt to ever-changing situations.

Cavalcanti (2022) emphasized the importance of improving existing products and services by leveraging digital resources and digital innovation, noting that digital transformation (DT) is related to changes in various areas.

Cardoso & Pereira (2023) discovered that digital culture (DC) is considered a crucial component of organizational strategy and dynamics, alongside knowledge, learning, and continuous improvement.

**Hypothesis 2: The relationship between cultural environment and personnel competency through digital transformation adoption**

Tierney (1998) found that, like other organizations, the importance of the cultural environment in higher education institutions is significant.
Desson & Clouthier (2010) stated that culture determines what organizations consider when making decisions and what employees regard as appropriate behavior.
Muthanna (2011) studied the cultural environment and found it crucial for the implementation of organizational strategies, noting that organizational culture is primarily a driving force that propels the organization forward.

**Hypothesis 3: The relationship between organizational structure and digital transformation adoption**

Njegovan & Kostic (2014) found that organizations each have their own ways of doing things, and it is essential to introduce these to newcomers. Socialization is described as the process that helps individuals find ways to become members of a social group.
Arnett (2015) found that socialization in organizations is a practice to equip new employees with the knowledge and skills of the organization. It is a process through which new employees receive information about the norms and roles necessary for functioning within the group or organization.

Taye & Sang (2018) discovered that the cultural environment has become a major concern within the business community over the past decade, leading to an increase in studies on organizational culture and highlighting that culture is a well-known topic on the academic agenda.

**Hypothesis 4: The relationship between organizational structure and personnel competency through digital transformation adoption**

Yeng & McLean (2010) explain the allocation of power and responsibility, as well as how management adheres to rules and regulations. They note that organizational structure clarifies job responsibilities, fostering harmonious working relationships among employees.

Oyebade (2011) comments that the organizational structure in Nigerian universities differs from other structures, being more complex due to the decentralized arrangement, hierarchical order, involvement in decision-making, centralization of power, and high levels of formalization. This complex organizational structure in Nigerian universities paves the way for various crises.

**Hypothesis 5: The relationship between open source AI adoption and digital transformation adoption**

Karvonen et al. (2018) found that this understanding further assumes that agility can be scaled from one project to another organizational level by using an agile framework. In agile organizations, the agile mindset is a key component that permeates throughout the organization.

Liviu Warter (2019) noted that higher education institutions are characterized as organizations distinct from other types. Higher education is clearly divided into various sectors within the organization, with faculty responsible for curricula and teaching.

Ta & Lin (2023) found that increased market penetration, reduced operational costs, and the implementation of simpler new business models are correlated advantages for SMEs adopting digital transformation.

**Hypothesis 6: The relationship between open source AI adoption and personnel competency through digital transformation adoption**

Luckin & Holmes (2016) stated that new technologies continually shape education. The adoption of AI in Education (AIed) by higher education institutions (HEIs) is expected to grow significantly, with technologies anticipated to transform teaching and learning. The rapid advancement of computer technology has facilitated the implementation of AIED.

Zawacki-Richter (2019) found that while the adoption of AIED technology presents challenges such as cost issues, scalability, and data privacy concerns, it also offers opportunities to improve the practices and education of HEIs.

Rodway (2023) found that educational applications of AI (AI) are being developed rapidly, and it seems reasonable to conclude that these applications will enhance student experiences and course satisfaction.

**Hypothesis 7: The relationship between digital transformation adoption and personnel competency**

Kim & Lee (2020) found that AI-powered chatbots are increasingly popular and widely used in e-commerce, online banking, and digital health and wellness.

Bozkus (2023) highlighted the ethical implications of adopting new technologies, noting that the rapid implementation of these technologies has undeniably revolutionized lifestyles and work practices, providing unprecedented opportunities for innovation, efficiency, and growth.

## 4. Research Framework

This research is a mixed-method study, both qualitative and quantitative. The researcher has established a conceptual framework based on the systems theory, concluding that the components of the system consist of (1) Inputs, (2) Processes, (3) Outputs, and (4) Feedback, which can be explained as follows:

(1) Inputs refer to the cultural environment, comprising four components: Social Influence, Condition of the System Facilities, Institutional Regulations, Influence from Customers; Organizational Structure consists of four elements: Top Management Support, Organizational Readiness, Organization Size, Management Ability; Open Source AI Adoption includes five aspects: Technical Compatibility, Ability to Try Out, Relative Advantage, Good Understanding of Technology, Innovation Deployment.

(2) Processes refer to the digital transformation adoption, which includes five dimensions: Data Management Capabilities Transformation, IT Roles Transformation, Business Models Transformation, Work Processes Implementation and Changes, Digital Adoption and Mindset Shift.

(3) Outputs denote personnel competency, consisting of three areas: Skills, Knowledge, Ability.

(4) Feedback refers to how personnel competency influences the cultural environment, organizational structure, and AI adoption.

The four components are interrelated, and none can exist in isolation. A change in one component will inevitably affect the others; any deficiencies or errors in one component will lead to shortcomings in the others. The details are as follows:

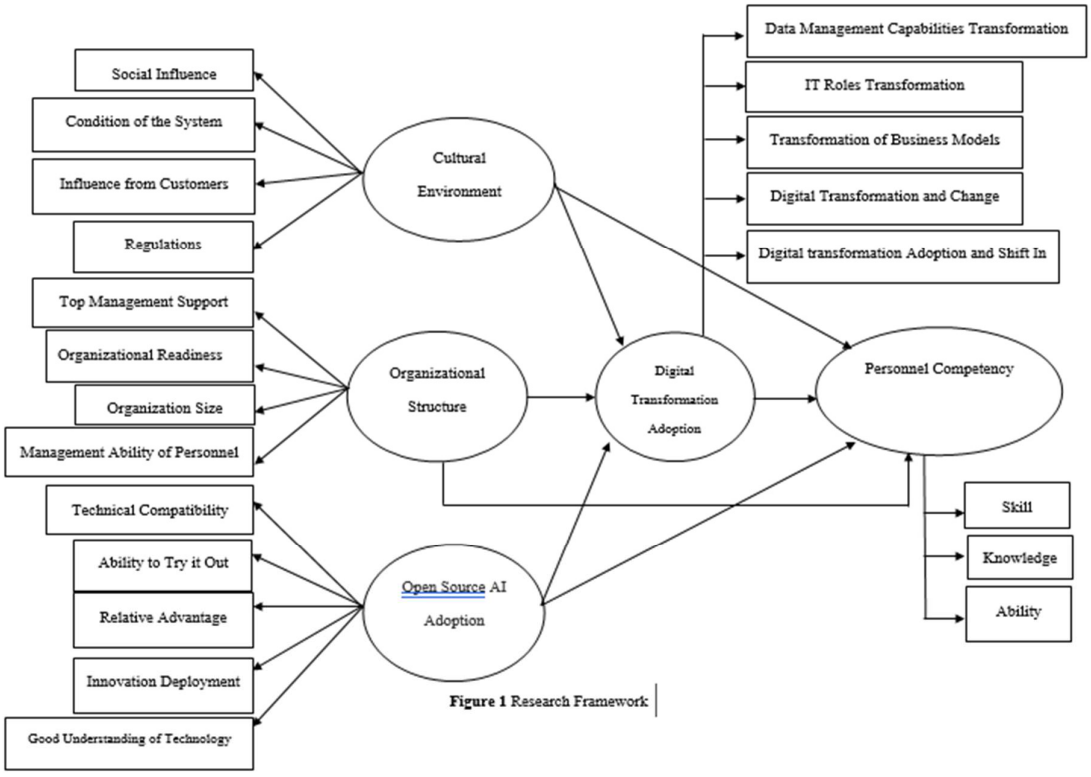


**Figure 1** Research Framework



## 5. Research Methodology

This research employs a mixed-methods approach, focusing on data collection from representatives of higher education institutions in Thailand, categorized as follows: 1) limited-access public universities, 2) unrestricted public universities, 3) government-affiliated universities, 4) Rajabhat universities, 5) Rajamangala University of Technology, 6) private universities, 7) private colleges, 8) private institutions, and 9) educational establishments outside the Ministry of Higher Education.

The population consists of 203,907 representatives from higher education institutions in Thailand, while the sample size includes 420 representatives. The selection method employed is structural equation modeling (SEM). The research framework includes 5 latent variables and 21 observed variables. Statisticians recommend that the sample size should be between 15 to 20 times the number of observed variables (Hair et al., 2006) to be considered suitable for multivariate analysis. Therefore, an appropriate sample size should range from 15 x 22 = 315 to 20 x 21 = 420.

The research tools consist of two types.
1) Questionnaire: Section 1: General organizational information of respondents, Section 2: Cultural Environment, Section 3: Organizational Structure, Section 4: Adoption of AI, Section 5: Digital Transformation Adoption, Section 6: Personnel Competency.

The researcher provided a draft of the questionnaire to five experts for statistical evaluation, calculating the item-objective congruence index (IOC) at 0.9842 and testing the reliability of the research instrument at 0.9763 to study the causal factors influencing digital transformation adoption affecting personnel competency in higher education institutions in Thailand.

2) Interview Questions:

- How do you think the cultural environment affects digital transformation adoption in your organization? (X1 - Y1)
- How do you think the cultural environment affects your personnel competency? (X1 - Y2)
- How does your organizational structure influence digital transformation adoption? (X2 - Y1)
- How does the organizational structure affect your personnel competency? (X2 - Y2)
- How does the adoption of AI impact digital transformation in your organization? (X3 - Y1)
- How does AI adoption affect your personnel competency? (X3 - Y2)
- How does digital transformation adoption impact your personnel competency? (Y1 - Y2)
- How do the cultural environment, organizational structure, and AI adoption influence digital transformation in your organization? (X1, X2, X3 – Y1)
- What is the importance of personnel competency in your organization? (Y2)
- If your organization recognizes the importance of personnel competency, how would you utilize it for benefit? (Y2)

The researcher collected data by conducting in-depth interviews from April 2024 to June 2024. After analyzing and synthesizing the information, the researcher wrote a descriptive narrative and performed content analysis to develop a model based on quantitative aspects.

**6. Research Results**

| **Objective 1** | **Research Findings** |
|---|---|
| Cultural Environment | Respondents generally rated their opinions on the cultural environment as high. When examining each aspect, four areas were rated as high: the highest was the influence from customers, followed by the condition of system facilities, institutional regulations, and social influence. |
| Organizational Structure | Respondents generally rated their opinions on organizational structure as high. When examining each aspect, four areas were rated as high: the largest was organization size, followed by support from top management, management ability of personnel, and organizational readiness. |
| Open Source AI Adoption | Respondents generally rated their opinions on the open source AI adoption as high. When examining each aspect, five areas were rated as high: the highest was relative advantage, followed by innovation deployment, ability to try out, technical compatibility, and good understanding of technology. |
| Digital Transformation Adoption | Respondents generally rated their opinions on the digital transformation adoption as high. When examining each aspect, one area was rated the highest and four areas were rated high: the highest was business model transformation, followed by data management capabilities transformation, IT roles transformation, digital adoption and mindset shift, and implementation and changes in work processes. |
| Personnel Competency | Respondents rated their opinions on the personnel competency of higher education in Thailand as high overall. When examining each aspect, three areas were rated high, with skills being the highest, followed by knowledge and abilities. |

| **Objective 2** | **Research Findings** |
|---|---|
| Cultural Environment (CTEV) | Has a positive direct influence on the digital transformation adoption (DGTF) with a direct effect size of 0.11, which is statistically significant at the 0.05 level. |
| Cultural Environment (CTEV) | Has a positive direct influence on the personnel competency (CSHE) with a direct effect size of 0.14, which is statistically significant at the 0.01 level. |

| | |
|---|---|
| Organizational Structure (OZST) | Has a positive direct influence on the digital transformation adoption (DGTF) with a direct effect size of 0.56, which is statistically significant at the 0.01 level. |
| Organizational Structure (OZST) | Has a positive direct influence on the personnel competency (CSHE) with a direct effect size of 0.18, statistically significant at the 0.01 level. |
| Open Source AI Adoption (OSAI) | Has a positive direct influence on the digital transformation adoption (DGTF) with a direct effect size of 0.28, statistically significant at the 0.01 level. |
| Open Source AI Adoption (OSAI) also | Has a positive direct influence the personnel competency (CSHE) with a direct effect size of 0.06, statistically significant at the 0.05 level. |
| Digital Transformation Adoption (DGTF) | Has a positive direct influence on the personnel competency (CSHE) with a direct effect size of 0.79, statistically significant at the 0.01 level. |
| Cultural Environment (CTEV), Organizational Structure (OZST), and Open Source AI Adoption (OSAI) | Has a positive direct influence on the personnel competency (CSHE) through digital transformation adoption (DGTF), with indirect effect sizes of 0.24, 0.54, and 0.22, respectively, all statistically significant at the 0.01 level. |

Objective 3: The research findings indicate that the development of the model derived from exploratory analysis and synthesis led the researcher to name the model for adopting digital transformation that impact personnel competency as the Digital Transformation for Personnel Competency Model (DTPC Model).

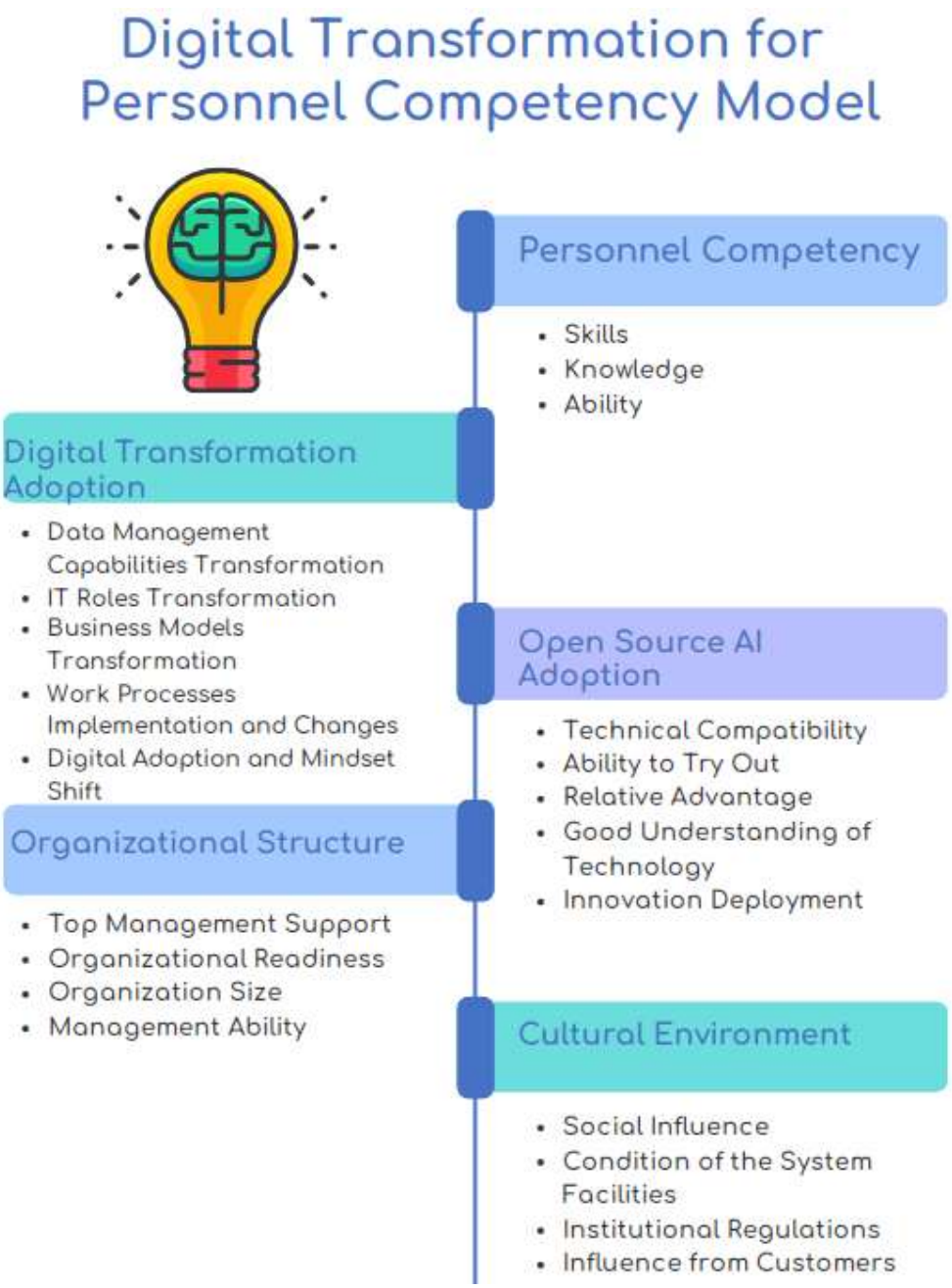


**Figure 2** Digital Transformation for Personnel Competency Model

**7. Conclusion**

Digital transformation has created new opportunities along with challenges in delivering quality education. The adoption of technology in teaching, knowledge management, and access to learning resources has become essential, prompting higher education institutions to update curricula, teaching methods, and management structures to meet these demands. However, challenges may arise during the adaptation to digital transformation, such as a lack of digital knowledge and skills among relevant personnel, technological limitations, and insufficient infrastructure for digital development. Additionally, inappropriate management approaches and business strategies may hinder the effective utilization of digital technology.

The researcher collected data through online questionnaires and in-depth interviews with representatives from higher education institutions in Thailand. The analysis concluded that the cultural environment influences the digital transformation adoption; the cultural environment impacts personnel competency through digital transformation;

organizational structure affects the digital transformation adoption; organizational structure influences personnel competency through digital transformation; the adoption of AI (AI) affects the digital transformation adoption; AI adoption impacts personnel competency through digital transformation; and digital transformation adoption influences personnel competency.

Institutions will be able to assess the potential impacts that may occur in the short and long term before deciding to implement new digital technologies.

**8. Discussion**

The results from Objectives 1 and 2 indicate that:

- Cultural Environment: It plays a crucial role in the digital transformation adoption within organizations. An open and supportive culture fosters positive attitudes towards technology, encouraging personnel to learn and adapt to new technologies. Support from leadership is also vital, as visionary leaders can guide the direction of technology use and build confidence within teams. Effective internal communication ensures that information about changes and the benefits of technology are clearly conveyed, aligning with Gregory Vial's (2019) findings.
- Cultural Environment and Personnel Competency: A culture that promotes learning enhances personnel confidence in trying new technologies. Clear and effective communication about the goals and benefits of digital transformation allows personnel to better understand their role, aligning with Tierney's (1998) research.
- Organizational Structure: A well-defined organizational structure significantly impacts the digital transformation adoption. An appropriate structure allows for agile decision-making and operations necessary for adapting to new technologies. When roles and responsibilities are clear, personnel better understand their part in the transformation process, consistent with Njegovan & Kostic's (2014) study.
- Organizational Structure and Personnel Competency: A clear and suitable structure defines personnel roles during transformation, enhancing their understanding of tasks needed for successful technology implementation. This supports findings by Yeng & McLean (2010).
- Open Source AI Adoption: The integration of AI profoundly influences the digital transformation adoption by enhancing operational efficiency and speed. AI can analyze large datasets quickly, providing valuable insights for decision-making, allowing personnel to maximize their time effectively, as noted by Karvonen et al. (2018).
- Open Source AI Adoption and Personnel Competency: The use of AI significantly impacts personnel capabilities by enabling them to complete complex and time-consuming tasks more quickly, which aligns with findings from Luckin (2016).
- Digital Transformation and Personnel Competency: The adoption of new technologies equips personnel with better tools and resources, significantly improving efficiency and reducing operational time, consistent with Ramadan and Zakhem's (2023) research.

The results from the research objective 3 indicate that the in-depth interviews led to the development of a causal relationship model regarding the digital transformation adoption and its impact on personnel competency.

**9. Research Contribution**

From the research findings, the study provides academic insights into the causal factors influencing the digital transformation adoption and its impact on personnel competency. The results enhance understanding of the relationships affecting various variables related to digital transformation and personnel competency. This knowledge can be further developed and expanded academically for studies and applications in other fields. Additionally, representatives from higher education institutions in Thailand can plan to establish a cultural environment, organizational structure, and the use of open source AI to manage their institutions effectively, thereby enhancing personnel competency through these transformations.

**10. Recommendation**

In future research, the causal model of digital transformation adoption and its impact on personnel competency should be further examined for alignment with empirical data. Additionally, future studies should investigate other significant factors that serve as causal elements in the digital transformation adoption affecting personnel competency, as there are several factors not yet explored. For example:

- Leadership Support: The commitment and backing from senior management are crucial for fostering a culture receptive to change and innovation.
- Access to Information: Having accurate and up-to-date information is essential for supporting decision-making regarding technology adoption.
- Training and Support: Training programs and support for personnel in utilizing new technologies are vital.
- Competitive Advantage: The benefits observed from technology usage, such as increased efficiency and enhanced market competitiveness.
- Market and Societal Pressures: The expectations from students, customers, and the labor market regarding the desired digital skills.

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