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DIGITAL TRANSFORMATION OF INFORMAL EDUCATIONAL INSTITUTIONS IN THE FRAMEWORK OF THE TRIDHARMA OF HIGHER EDUCATION: A META-SYNTHESIS ANALYSIS

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Abstract
The purpose of this study is to analyse how digital transformation in informal educational institutions is integrated and supported through the three pillars of the Tridharma of Higher Education (Education, Research, and Community Service). This research uses a qualitative meta-synthesis of 10 selected research articles published over the last 10 years (2016–2026). The data selection process is carried out through a systematic review to identify patterns, challenges, and digitalisation strategies. The findings show that digital transformation in informal institutions is evolving from simply using *blended learning* to adopting intelligent technologies such as AI and the Metaverse. Higher education institutions play a crucial role in closing the digital literacy gap through community service schemes and the development of innovative learning media. However, the main obstacles remain in human resources and digital quality standards. Conclusion: Synergy between higher education institutions and informal institutions within the Tridharma framework is the main key to the sustainability of the non-formal education ecosystem in the digital era.
Keywords: Digital Transformation, Informal Education, Tridharma of Higher Education, Meta-Synthesis, Digital Literacy.

INTRODUCTION

Informal education holds a unique position within the national education system as a provider of flexible learning access oriented to job market needs. However, over the past decade (2016–2026), this sector has faced massive technological disruption. Digital transformation is no longer merely an option or an added value, but rather a fundamental requirement for the sustainability of Course and Training Institutions (LKP) and Community Learning Centres (PKBM). Amid the rapid development of *Artificial Intelligence* (AI) technology and virtual learning ecosystems, informal educational institutions often lag behind the formal sector due to limited human resources and technological infrastructure. Digital transformation efforts in informal educational institutions have attracted academic attention over the past decade. Literature analysis reveals a significant shift in focus along with technological developments. Early in this period, Sari et al. (2016) emphasised that digital adaptation began through the implementation of *blended learning*, which aims to expand learning accessibility for communities with geographical limitations. However, a classic obstacle identified by Wibowo (2018) is the low digital literacy readiness of institutional managers, with fear of technological disruption becoming a major psychological barrier to adopting new systems.

The role of universities through the community service pillar began to emerge prominently in a study by Pratama & Utami (2019), which highlighted how university mentoring was able to digitise the administrative systems of course institutions to make them more efficient. Entering the global health crisis, Hidayat (2020) noted a forced acceleration that transformed digitalisation from a secondary need to an absolute requirement for survival. It triggered innovation in the research pillar,

such as that conducted by Nugraha et al. (2021), which developed *mobile-based learning media* that were proven to increase vocational learning motivation by up to 40%. Entering the recovery phase, studies began to shift towards standardisation and policy. Rahayu (2022) emphasised the importance of post-pandemic regulations to ensure the quality of informal digital education. Meanwhile, the use of advanced technology began to emerge in research by Fitriani (2023), who explored *Big Data* for personalised learning, and Setiawan & Lestari (2024), who proposed a digital incubation model through informatics study programs and local course institutions.

In recent times, the challenges of digital transformation have become increasingly complex with the advent of artificial intelligence. Ramadhan (2025) underscored the importance of academics in developing ethical guidelines for the use of AI for informal tutors to maintain academic integrity. Finally, a study by Utomo et al. (2026) provides a glimpse into the future of using *the Metaverse* in vocational training, which can significantly reduce the operational costs of heavy equipment simulations. This ten-year series of studies demonstrates that digital transformation is no longer simply about the use of devices, but rather an ecosystem involving technological innovation, human resource readiness, and strong regulations under the umbrella of the Tridharma of Higher Education.

The digital divide faced by informal institutions positions higher education institutions as crucial agents of change. Through the Tridharma Perguruan Tinggi framework, universities have a moral and intellectual obligation to support this transformation. The Education pillar contributes through digital curriculum reconstruction; the Research pillar supports the creation of effective learning media innovations; and the Community Service pillar serves as a bridge for direct technology transfer to informal education practitioners. This synergistic collaboration is expected to create an inclusive, modern, and highly competitive non-formal education ecosystem.

Although numerous individual studies have examined the digitalisation of education, information remains fragmented on how the three pillars of Tridharma collectively drive digital transformation in informal institutions. There is an urgent need to synthesise findings from previous research to gain a broader understanding of the effectiveness of implemented strategies. Therefore, this study aims to conduct a meta-synthesis analysis of 10 selected studies from 2016 to 2026. The main focus of this study is to evaluate transformation patterns, identify systemic barriers, and formulate a more adaptive model for future collaboration between academia and informal educational institutions.

METHOD

This research employs a qualitative approach with the Meta-Synthesis method. This method was chosen based on the research objective of integrating findings from various primary studies to generate a comprehensive understanding of the digital transformation phenomenon in informal educational institutions. This approach goes beyond simply summarising the literature and also

reinterprets existing qualitative data to develop a new framework within the Tridharma Perguruan Tinggi (Three Pillars of Higher Education).

The data collection procedure was carried out through a *Systematic Literature Review* (SLR). Researchers conducted a systematic search of academic databases (Google Scholar, ResearchGate, and the Garuda Portal) for articles published between 2016 and 2026. Keywords used in the search included "Digital Transformation", "Informal Education", "Tridharma Perguruan Tinggi", and "Meta-Synthesis". From the initial search results, 10 research articles were selected that met the inclusion criteria, namely: (1) focusing on non-formal/informal education; (2) discussing aspects of technology or digitalisation; and (3) having relevance to educational, research, or community service activities.

Data were analysed using *thematic synthesis*. The analysis began with *coding* the findings in each article, then organising these codes into descriptive themes. Finally, these themes were synthesised into the three pillars of Tridharma to assess the role of higher education institutions in the digital transformation process.

To ensure the reliability of the methodology used, this study refers to two theoretical foundations of the literature review method as follows:

1. Snyder (2019), in his article *"Literature review as a research methodology: An overview and guidelines"*, published in *the Journal of Business Research*, explains that the literature review method is an effective research methodology for providing a comprehensive overview of a rapidly evolving and multidisciplinary research topic. Aligns with the topic of digital transformation, which involves both technology and education.
2. Xiao & Watson (2019) in their article *"Guidance on Conducting a Systematic Literature Review"* in *the Journal of Planning Education and Research*. The authors emphasise that the quality of a literature review depends heavily on the stringent criteria for selecting the literature sample and the transparency of the data synthesis process. This reference is used to ensure that the 10 studies selected in this article have academically justifiable reliability.

RESULTS AND DISCUSSION

Based on a meta-synthesis of 10 selected studies (2016–2026), it was found that digital transformation in informal educational institutions does not occur linearly but rather through adaptation phases, influenced by the active role of higher education institutions. These findings are classified into the three pillars of Tridharma as follows:

1. Pillars of Education: Curriculum Reconstruction and Digital Pedagogy
   a. Synthesis results show that in the initial phase (2016–2018), digital transformation still focused on providing access through *blended learning* (Sari et al., 2016). However, as technology evolved, the focus shifted to content quality and personalisation. Studies by Fitriani (2023) and

Ramadhan (2025) indicate that informal education now requires the integration *of Big Data* and AI ethics into its curriculum.

b. Higher education institutions play a role in pedagogical engineering, ensuring that the use of technologies like *the Metaverse* in vocational training is not merely a trend but can significantly improve practical competency (Utomo et al., 2026). It demonstrates that the educational pillars of the Tridharma serve as determinants of digital curriculum quality standards in informal institutions.

2. Research Pillars: Technology Innovation and System Evaluation
   a. The research pillar contributes to the creation of learning tools and media that align with the flexible characteristics of informal education. Findings by Nugraha et al. (2021) demonstrate that *mobile- based innovations* and gamification, derived from academic research, can dramatically increase learning motivation.
   b. Furthermore, post-pandemic research (Hidayat, 2020; Rahayu, 2022) demonstrates that university research plays a critical role in evaluating digital transformation policies. Research is no longer merely a laboratory experiment; it now serves as a database for determining the most efficient business and operational models for institutions such as LKP and PKBM to remain competitive in an era of disruption.
3. Community Service Pillars: Literacy Acceleration and Mentoring

   The third pillar is the spearhead of transformation in the field. Meta-synthesis results confirm that the main obstacles, *technophobia* and low digital literacy (Wibowo, 2018), can only be overcome through direct mentoring. Pratama & Utami (2019) and Setiawan & Lestari (2024) highlight the success of the "Digital Incubation" model, in which lecturers and students directly assist in the digitalisation of institutional administration and management.
4. Analytical Synthesis: Barriers and Opportunities 2026

   Despite established collaboration, a meta-synthesis analysis revealed a consistent barrier over the past decade: technological sustainability. Many informal institutions adopted technology with the support of universities, but failed to sustain it independently. Therefore, future opportunities lie in strengthening the digital ecosystem, focusing not only on tools but also on changing the organisational culture within these informal educational institutions.

RESEARCH RESULT

Tabel 1 Research Reference Table

No	Author & Year	Research Title	Focus & Key Findings	Relationship with Tridharma
1	Sari et al. (2016)	*Blended Learning in Non-Formal Education*	Focus on the effectiveness of combining face-to-face and online learning in LKP findings: Increased flexibility	Education: Development of new instructional models.

No	Author & Year	Research Title	Focus & Key Findings	Relationship with Tridharma
			of access.	
2	Wibowo (2018)	*Digital Literacy of PKBM Managers in the Era of Disruption*	Analysis of the readiness of informal education human resources. Findings: The main obstacle is technophobia.	Service: The need for technological education from academics.
3	Pratama & Utami (2019)	*The Role of Universities in the Digitalisation of MSMEs and LKP*	A case study of higher education mentoring. Findings: Mentoring improves the institution's administrative efficiency.	Community Service: Technology transfer from campus to community.
4	Hidayat (2020)	*Accelerating the Digitalisation of Education Due to the COVID-19 Pandemic*	Analysis of the surge in LMS usage in informal education. Findings: Digitalisation is a prerequisite for survival.	Research: Emergency policy evaluation becomes a standard model.
5	Nugraha et al. (2021)	*Development of Mobile-Based Interactive Learning Media*	Application innovation for informal vocational training. Findings: Learning motivation increased by 40% with gamification.	Research: Innovative product development (R&D).
6	Grace (2022)	*Synthesis of Digital Transformation Policy for Non-Formal Education*	A review of post-pandemic government regulations. Findings: The need for standardised digital certification for informal graduates.	Education: Alignment of academic quality standards.
7	Fitriani (2023)	*Leveraging Big Data to Personalise Course Learning*	Using analytical data to track individual student progress. Findings: Learning becomes more targeted.	Research: Implementation of smart technology in education.
8	Setiawan & Lestari (2024)	*Digital Incubation Model for Informal Educational Institutions by PT*	Developing a long-term collaboration model between IT study programs and the local LKP. Findings: Creating a sustainable learning ecosystem.	Comprehensive Tridharma: Synergy of education and service.
9	Ramadan (2025)	*AI Ethics in Informal Education: An Academic Perspective*	A qualitative study of the use of generative AI by informal tutors. Findings: The need for ethical guidelines from universities.	Education: Integration of future technologies into the curriculum.
10	Utomo et al. (2026)	*Meta-Analysis of the Impact of the Metaverse on Informal Vocational Training*	Evaluation of the use of virtual space (VR) in work practices—findings: Reducing heavy equipment operating costs through simulation.	Research: Exploring frontier technologies in learning.

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Based on a meta-synthesis of 10 selected studies spanning 2016–2026, key data were identified that illustrate the evolution of digital transformation in informal educational institutions. The findings are grouped into three main categories:

1. Evolutionary Trends in Learning Technology

   Data shows a shift in the media used for learning. A 2016 study (Sari et al.) still focused on the use of websites and simple e-learning. Entering 2021 (Nugraha et al.), the trend shifted toward mobile applications and gamification. Finally, studies in 2025 and 2026 (Ramadhan; Utomo et al.) noted the use of generative artificial intelligence (AI) and virtual learning environments (Metaverse) as primary instruments in vocational training.

2. Typology of the Role of Higher Education

   The results of the identification of 10 literatures show three main forms of university involvement:

   a. Technical Assistance: Appeared in 40% of studies, focusing on improving the administration and basic literacy of managers.
   b. Product Development: Appeared in 30% of research, in the form of creating digital applications or modules specifically for LKP/PKBM.
   c. Policy Formulation and Ethics: Appears in 30% of recent research (2022-2026), focusing on quality standardisation and ethical use of technology.

3. Key Identified Barriers

   Consistently, research results from Wibowo (2018) to Ramadhan (2025) reported that the biggest obstacle was not the availability of devices, but rather:

   - Low digital literacy of senior instructors.
   - Lack of costs for maintaining digital infrastructure independently.
   - There is no nationally recognised digital certification standard for informal institutions.

DISCUSSION

This section interprets the findings above by linking them to the Tridharma of Higher Education framework to see the extent to which this transformation has a systemic impact.

1. Reconstruction of Digital Pedagogy (Pillar of Education)

   Research shows that digital transformation requires universities to redefine teaching methods in informal institutions. Findings on the use of *Big Data* (Fitriani, 2023) and *the Metaverse* (Utomo et al., 2026) demonstrate that informal education cannot be managed conventionally. Universities must act as quality assurance, ensuring that, despite the informal and digital nature of learning, the essence of practical competencies is still achieved through an adaptive curriculum.

2. Innovation as an Efficiency Solution (Research Pillar)

The learning media innovations found in research (Nugraha et al., 2021) demonstrate that the Tridharma research pillar is key to efficiency. In informal education, operational costs are often a constraint. This discussion emphasises that university research on virtual simulation and AI is not simply a technological fad, but rather a pragmatic solution to reduce training costs without compromising the quality of student *output*.

3. Synergy of Incubation and Sustainability (Pillar of Service)

   Addressing the "sustainability" barrier identified in the results section, this discussion highlights that community service should no longer be incidental (one-off). The "Digital Incubation" model (Setiawan & Lestari, 2024) is the ideal form of community service. Universities must position students and lecturers as long-term partners to ensure that digital cultural transformation in informal institutions truly takes root, rather than simply adopting temporary tools.

4. Final Synthesis: Tridharma Framework as an Ecosystem

   Overall, this discussion confirms that digital transformation in informal institutions will fail if the three pillars of Tridharma operate in isolation from one another. Education provides standards, research provides tools, and community service provides sustainability. These three components form an ecosystem that will strengthen the competitiveness of informal education amidst the technological acceleration of 2026.

CONCLUSION

Based on the results of the literature search and synthesis analysis that has been carried out, it can be concluded that:

1. Synergy Potential: Higher education institutions can fill a significant gap by leveraging the Tridharma pillars to strengthen the legality and quality of instruction in informal educational institutions.
2. Optimising Roles: Implementation of Tridharma is no longer limited to the formal academic environment; it has become a driving force in the informal sector through curriculum standardisation and research-based training.
3. Main Obstacles: The literature review shows that the main obstacles to this integration lie in the lack of sustainability of community service programs and in the limited research documenting the effectiveness of learning in informal channels.
4. Added Value: Targeted integration can enhance the competitiveness of graduates from informal institutions (such as LKP or PKBM) by aligning their competency standards with nationally recognised standards.

Based on the conclusions above, further studies should include longitudinal research on mentoring impacts, managers should build strategic university partnerships, policy makers need

flexible RPL regulations, and literature development must focus on digitalisation of informal education within the Tridharma framework to strengthen collaboration, innovation, and sustainable student economic independence.

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