TPM Vol. 32, No. S6, 2025
ISSN: 1972-6325
https://www.tpmap.org/

Open Access

INTEGRATING KNOWLEDGE MANAGEMENT SYSTEMS WITH TRANSACTIVE MEMORY SYSTEMS: A MODEL FOR ENHANCING ORGANIZATIONAL INTELLECTUAL CAPITAL IN HIGHER EDUCATION INSTITUTIONS

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ABSTRACT

This study aims to develop a model for integrating Knowledge Management Systems (KMS) with Transactive Memory Systems (TMS) to enhance Intellectual Capital in higher education institutions. A quantitative approach was employed using the Partial Least Squares–Structural Equation Modeling (PLS-SEM) method via the SmartPLS 2024 software, supported by primary data from surveys and in-depth interviews at 11 universities. The results of the outer model analysis indicate that all KMS and TMS indicators meet the criteria for convergent and discriminant validity, with Composite Reliability and Average Variance Extracted values above the minimum threshold. The inner model analysis revealed that TMS has a positive and significant effect on KMS ($\beta = 0.288$; $t = 4.046$; $p < 0.001$), which further contributes to the enhancement of organizational Intellectual Capital. Contextual findings indicate that although KMS platforms are available at universities, integration with the TMS approach is not yet optimal, individual expertise mapping is not yet structured, internal-external coordination in the utilization of faculty expertise is still limited, and the integration of Tridharma activities and the Merdeka Belajar program is not yet facilitated by a centralized system. This study contributes theoretically by offering a KMS–TMS integration model that can strengthen institutional intellectual assets, as well as practical implications for university administrators in designing more collaborative, structured, and integrated policies and systems.

Keywords: Knowledge Management Systems, Transactive Memory Systems, Intellectual Capital, higher education, PLS-SEM.

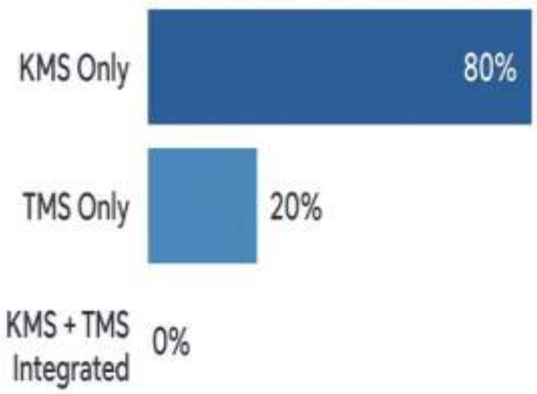
INTRODUCTION

Higher education institutions are centers of knowledge development and innovation with a strategic mandate through the Tridharma of Higher Education, namely education, research, and community service. In the era of technological disruption and globalization, the success of higher education institutions is not only measured by physical facilities or funding, but also by their ability to manage intellectual capital—intangible assets that include knowledge, skills, networks, and the innovative capacity of theacademic community (Marulanda-Grisales & Vera Acevedo, 2022)

Effectiveintellectualcapital managementrequiresa system capable of integratingthe processes of knowledge creation, storage, distribution, and utilization. In this context, Knowledge Management Systems (KMS) serve as a key tool to facilitate structured knowledge management through information technology support (Akbar, 2018).

Knowledge Management Systems (KMS) serve as digital platforms used to document and share organizational knowledge in a structured manner. In the context of higher education, KMS are utilized to manage research data and publications, store learning materials and teaching innovations, and facilitate collaboration between faculty, students, and external partners. The integration of KMS with TMS in a university environment opens up opportunities for the creation of a system that not only functions as a knowledge repository but also as a guide to relevant expertise holders, accelerating the flow of knowledge and effectively strengthening cross-unit collaboration (Dneprovskaya, 2023).

Already have a Knowledge Management System (KMS) to support knowledge management, with 80% of them using it for storing research data, teaching materials, and administration. However, the implementation of a Transactive Memory System (TMS) remains very limited, with only 20% of universities having a system for mapping faculty expertise, and even then, this is typically done manually through human resources databases. Furthermore, no university has fully integrated KMS and TMS, meaning that knowledge repositories cannot be directly linked to the expertise maps of academic staff. This situation has implications for internal and external collaboration, which remains fragmented, dependent on individual initiatives or specific work units, and insufficient support for the implementation of the Tridharma due to the lack of connection with faculty performance evaluation systems and centralized reporting to the government (Anardeni, et al., 2021).



Fiture 1. KMS and TMS Immplementation Levels In Higher Education (n=15)

The implementation rate of Knowledge Management Systems (KMS) and Talent Management Systems (TMS) in higher education institutions, with a total of 15 respondents (n=15). Based on the data, the implementation of KMS alone dominates with a percentage of 80%, indicating that most higher education institutionsare more focused on knowledge management than on integration with talent management. Meanwhile, the implementation of TMS alone stands at 20%, indicating that higher education institutions still have a l ow focus on talent management and development separate from the knowledge system. Interestingly, no higher education institutions have implemented KMS and TMS in an integrated manner (0%), indicating that there is still a gap in the integration of knowledge management and talent management systems in the higher education environment. This data can serve as a basis for designing more integrated system development strategies to enhance the effectiveness of human resource and knowledge management in higher education institutions (Abu Wadi & Khalf, 2021).

The identified research gap reinforces the urgency of developing a KMS-TMS integration model in higher education. First, there is a lack of system integration, where KMS is only used as a data repository without TMS support to link knowledge with sources of expertise. Second, knowledge coordination is not yet optimal because information transfer is still done manually and across units that are not always coordinated. Third, there is insufficient support for the assessment of Tridharma, as the existing system is unable to provide centralized reporting based on faculty expertise mapping (Halibas et al., 2020).

Based on these conditions and gaps, this study aims to develop a KMS and TMS integration model that can systematically map the expertise of the academic community, connect knowledge repositories with sources of expertise, support internal-external collaboration, and strengthen the implementation of Tridharma. With this model, it is hoped that the intellectual capital of higher education institutions can increase sustainably and contribute to the competitiveness of institutions at the national and global lev els.

II. LITERATURE REWIEW

A. Knowledge Management System (KMS)

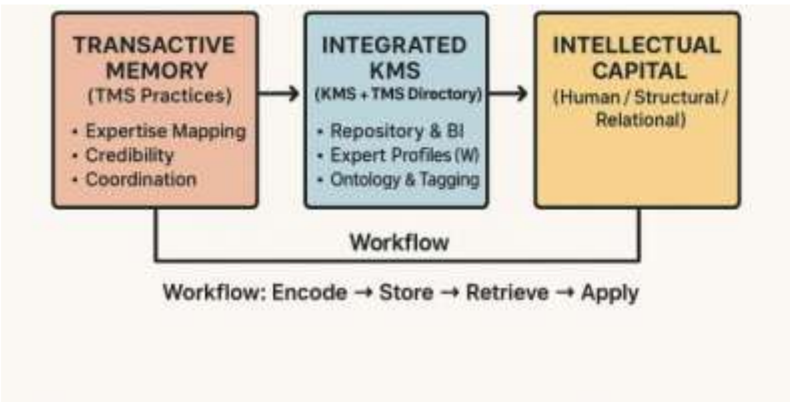
A Knowledge Management System (KMS) is a set of processes and technologies designed to support the knowledge lifecycle within an organization, which includes creation, storage, preservation, dissemination, and application of knowledge to achieve the organization's strategic objectives (Pratiwi & Hansugian, 2029). . In the context of knowledge-based organizations such as higher education institutions, KMS serves as a means to manage academic, research, and administrative information in an integrated manner to support theimplementation of the Tridharma Perguruan Tinggi (Three Pillars of Higher Education). KMS not only facilitates the management of explicit knowledge—such as documents, research reports, and databases—but also helps convert tacit knowledge into explicit knowledge so that it can be widely accessed by all members of the organization (Munadi et al, 2019). The three main functions of KMS include knowledge generation (creating new knowledge through research and innovation), knowledge preservation (storing knowledge in a secure and easily accessible repository), and knowledge dissemination (distributing knowledge to all internal and external stakeholders). Optimal implementation of KMS can improve organizational efficiency, accelerate information flow, and ensure the sustainability of knowledge in the long term.

B. **Transactive Memory System (TMS)**

The Transactive Memory System (TMS) is a social-cognitive mechanism that enables members of a team or organization to know who knows what and how to access that knowledge effectively (Huang. C.-C., & Chen, P.-K. 2017). TMS facilitates three main processes: encoding (encoding knowledge through identifying experts in specific fields), storage (storing knowledge in individuals with the most appropriate competencies), and retrieval (retrievingknowledge from relevant and credible sources). In modern organizations, particularly higher education institutions, TMS can be used to map the expertise of faculty, researchers, and staff so that cross -disciplinary collaboration becomes more focused (hartsuiker, 2019). Key components of TMS include specialization (structured knowledge sharing among members), credibility (level of trust in the expertise of other members), and coordination (ability to collaborate effectively to leverage sharedknowledge). With the integration of information technology, TMS can serve as a meta-knowledge layer that helps KMS users quickly and accurately find the most appropriate knowledge sources (Bindra et al., 2023).

C. **Intellectual Capital (IC)**

Intellectual capital is an intangible asset that includes knowledge, skills, experience, and the ability of an organization to create sustainable added value (Amin & Abas, 2021). Generally, IC is divided into three main components: human capital (individual competencies, creativity, and experience), structural capital (infrastructure, work processes, organizational culture, and databases that support performance), and relational capital (networks and partnerships with external parties such as industry partners, government, and the academic community). In the context of higher education, IC reflects the quality of educators and researchers, the strength of the academic support system, and the breadth of collaborative networks. Enhancing IC directly impacts academic reputation, graduate quality, research innovation capabilities, and institutional competitiveness at both the national and international level (Owlia et al., 2020).



Fiture 2. Feedback and Update

D. **The Relationship between KMS, TMS, and Intellectual Capital**

The integration between KMSand TMS creates a more effectiveknowledge management ecosystem, as these two systems complement each other in managing information and expertise within an organization. KMS functions as a technological platform that manages both explicit and tacit knowledge, while TMS acts as a social- cognitive mechanism that ensures this knowledge is distributed to the right people, can be easily retrieved, and used optimally (Riswanto, 2021). The combination of KMS enhanced by TMS enables organizations to not only manage what we know but also who knows what, thereby acceleratingdecision-makingprocesses andinnovation. The outcome of this integration will enhance an organization's intellectual capital, as more structured knowledge management processes strengthen human capital through improved individual competencies, reinforce structural capital through integrated systems and processes, and expand relational capital through more effective collaboration with external parties. In higher education institutions, this integration model is relevant for accelerating the dissemination of academic knowledge, facilitating interdisciplinary research collaboration, and supporting adaptive, innovative, and globally competitive university governance (Rahmat, 2022)

Fiture 3. Mechanism And Workflow Of The Model (Step By Step)

III. RESEARCH METHODOLOGY

This study uses a mixed-method approach with a quantitative dominance to test the integration model of the Knowledge Management System (KMS) and Transactive Memory System (TMS), as well as qualitative components for initial exploration and model validation. The research location covers 15 universities in West Java with 150 respondents selected through purposive sampling from lecturers and knowledge management staff. The research variables include TMS (specialization, credibility, coordination) as independent variables, KMS (knowledge creation, storage, transfer) as dependent variables, and intellectual capital as the outcome. Primary data were collected through surveys using Likert-scale questionnaires, in-depth interviews, focus group discussions (FGDs), and field observations, while secondary data were obtained from policy documents and institutional reports. The research instruments were developed based on indicators from the literature and tested for content validity by experts, then tested for construct validity and reliability using outer model analysis (convergent validity, discriminant validity, composite reliability, AVE) in SEM-PLS. Quantitative analysis was followed by inner model testing to examine causal relationships between variables through path coefficients, t-statistics, p-values, and R^2, while qualitative analysis used thematic analysis with triangulation of sources and methods. The research procedure includes preliminary studies, initial model development, qualitative validation, instrument testing, data collection, SEM-PLS analysis, qualitative-quantitative integration of results, and recommendation formulation, with due regard to research ethics principles such as informed consent and data confidentiality.]

I. RESULT / FINDING

Outer Model 1st Stage

Measurement model testing was conducted to evaluate the validity and reliability of the indicators that form each latent construct. This testingincluded convergent validity testing, discriminant validity testing, and reliability testing.

1. Convergent Validity

Table 1. Validity of indicators to dimensions

No	Variable	Dimension	Indicator	Loading Factor Estimate	Std. Dev	t-test	p-Value	Significant
		TMS-1	TMS1	0.6125	0.017	53.185	0.0000	Sign.
			TMS2	0.5944	0.025	11.859	0.0000	Sign.
			TMS3	0.55	0.037	21.180	0.0000	Sign.
1.	TMS	TMS-2	TMS4	0.5847	0.028	30.542	0.0000	Sign.
			TMS5	0.5639	0.039	20.790	0.0000	Sign.
			TMS6	0.5819	0.028	30.396	0.0000	Sign.
		TMS-3	TMS7	0.4361	0.076	5.742	0.0000	Sign.
			TMS8	0.5167	0.086	8.628	0.0000	Sign.
			KMS1	0.3965	0.078	7.316	0.0000	Sign.
		KMS-1	KMS2	0.6139	0.028	32.008	0.0000	Sign.
			KMS3	0.6125	0.021	41.473	0.0000	Sign.
			KMS4	0.5035	0.047	15.471	0.0000	Sign.
			KMS5	0.5201	0.053	14.258	0.0000	Sign.
		KMS-2	KMS6	0.5146	0.051	14.589	0.0000	Sign.
			KMS7	0.5562	0.034	23.660	0.0000	Sign.
2.	KMS		KMS8	0.5806	0.026	32.638	0.0000	Sign.
			KMS9	0.4625	0.058	11.512	0.0000	Sign.
			KMS10	0.6312	0.016	57.720	0.0000	Sign.
		KMS-3	KMS11	0.6326	0.017	54.605	0.0000	Sign.
			KMS12	0.4007	0.094	6.113	0.0000	Sign.

Source: SmartPLS, 2024

p-value < 0.05. This indicates that the indicators have a sufficient correlation with the measured construct. Based on the analysis results, all TMS (TMS1–TMS8) and KMS (KMS1–KMS12) indicators have outer loading values above 0.3 with p-values < 0.05, making them statistically valid. However, according to academic literature such as Haji-Othman, Y., & Yusuff, M. S. S. (2022), indicators with loadings between 0.40 –0.70 should be considered for removal if their removal can improve composite reliability (CR) or average variance extracted (AVE), while indicators with loadings < 0.40 should be removed. A similar principle is also stated by other researchers that the ideal loading value is ≥ 0.70, although values above 0.50 are still acceptable, especially in exploratory research. Thus, although the loadingvalues in this study are above the minimum threshold (≥ 0.3) and significant, they are still below the optimal standard. However, they remain acceptable if the overall reliability and construct validity meet the recommended criteria.

2. Discriminant Validity

Table 2. Discriminant Validity Indicators to Dimensions

	KMS	KMS-1	KMS-2	KMS-3	TMS	TMS-1	TMS-2	TMS-3
KMS	0.5833							
KMS-1	0.5583	0.5517						
KMS-2	0.6674	0.48194	0.5243					
KMS-3	0.5937	0.36111	0.5243	0.5653				
TMS	0.3951	0.31458	0.3576	0.3694	0.4882			
TMS-1	0.3701	0.26389	0.3424	0.3625	0.6063	0.6035		
TMS-2	0.3757	0.29653	0.3431	0.3459	0.6535	0.5382	0.5666	

TMS-3	0.2843	0. 26181	0.2459	0.2521	0.5584	0.3639	0.4452	0.5153

Source: SmartPLS, 2024

The cross-loading results show that each indicator has a higher correlation with the construct it represents than with other constructs. The AVE (Average Variance Extracted) of all constructs is > 0.5, which means that the constructs have good discriminatory power.

The findings that each indicator shows higher cross-loading on its own construct compared to other constructs, along with AVE values above 0.5, strengthen the discriminant and convergent validity of the constructs. Haji-Othman, Y., & Yusuff, M. S. S. (2022) also emphasize the importance of these two aspects in measuring the quality of reflective model constructs in PLS-SEM. Thus, your findings are within the widely accepted methodological standards in PLS-SEM-based quantitative research.

3. Reliabilitas Konstruk

Table 3. Reliability of Indicators to Dimensions

No	**Variable**	**Dimension**	**Indicator**	**CR**	**Expl.**	**AVE**	**Exp.**
TMS2 TMS3							
1.	**TMS**	**TMS-2**	**TMS4**	0.59444	Valid	0.59583	Valid
			TMS5				
			TMS6				
		TMS-3	**TMS7**	0.54444	Valid	0.56042	Valid
			TMS8				
			KMS1				
		KMS-1	**KMS2**	0.57639	Valid	0.52431	Valid
			KMS3				
			KMS4				
			KMS5				
2.	**KMS**	**KMS-2**	**KMS6**	0.61667	Valid	0.56181	Valid
			KMS7				
			KMS8				
			KMS9				
			KMS10				
KMS-3			**KMS11**	0.59097	Valid	0.58194	Valid
			KMS12				

Source: SmartPLS, 2024

The CR (Composite Reliability) values for TMS and KMS are above 0.5, indicating adequate internal consistency. The Composite Reliability (CR) values for the TMS and KMS constructs, which are above 0.5, do indeed indicate internal consistency. However, according to PLS-SEM methodological literature, the threshold is generally higher—specifically above 0.7 (Haji-Othman, Y., & Yusuff, M. S. S., 2022). Additionally, SmartPLS and various other methodological guidelines stipulate that CR and Cronbach's Alpha above 0.7 are considered acceptable (green), while values below that fall into the "questionable" (red) category. Several empirical studies support that CR should ideally not be below 0.8, let alone below 0.7. Therefore, while CR > 0.5 in your study indicates a basis for reliability, to meet stronger academic and methodological standards, it is advisable to improve the CR of TMS and KMS or report their details to achieve the minimum threshold of 0.7.

Inner model on 2nd Stage

The relationship between variables was tested using the Partial Least Squares–Structural Equation Modeling (PLS-SEM) method with the bootstrapping technique.

Table 7. Structural Model Evaluation

Hubungan	**Path Coefficient**	**t-statistic**	**p-value**	**Keterangan**
TMS → KMS	0,288	4,046 (> 1,96)	0,000 (< 0,05)	Signifikan

Source: SmartPLS, 2024

The results of the structural model testing show that a path coefficient value of 0.288 indicates a positive influence of the Talent Management System (TMS) on theKnowledge Management System (KMS). A t -statistic value of 4.046, whichis greater than 1.96, and a p-value of 0.000, which is lessthan 0.05confirm that this influence is statistically significant. Practically, this finding indicates that an increase of 1 standard deviation in TMS will

increase KMS by 0.288, so it can be concluded that the effective implementation of TMS can strengthen the implementation of KMS in an organization.
The finding that TMS (Talent Management System) significantly positively influences KMS (Knowledge Management System)—with a path coefficient of 0.288, a t-statistic of 4.046 (>1.96), and a p-value < 0.05—is empirically consistent with previous research. Additionally, the findings are consistent with studies in the hospitality sector, which confirm that TMS dimensions—such as credibility, coordination,and specia lization—enhance innovation capabilities andstrengthen knowledge management practices (González-Mohíno et al., 2024). Overall, your research findings reinforce the academicevidence that the role of TMSis important in strengthening KMS and enhancing organizational knowledge capabilities—which aligns both methodologically and practically with previous literature.

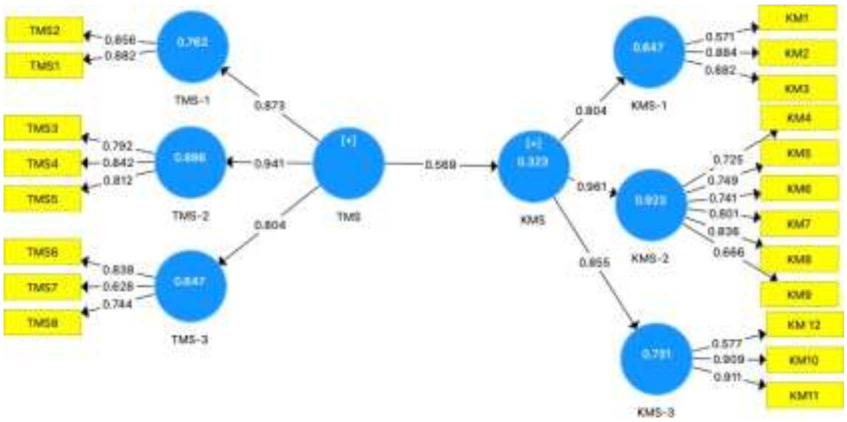


Figure. 4. 1st Stage's Standardized Model (Source: SmartPLS, 2024)

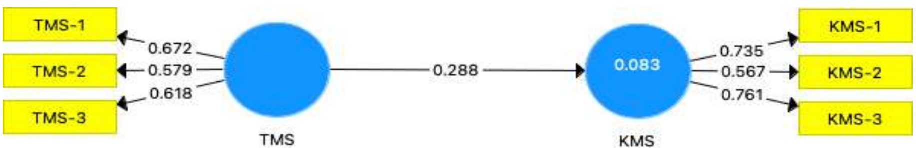


Figure. 5. 2nd's Stage Standardized Model (Source: SmartPLS, 2024)

Figure. 6 2nd's Stage t-model (Source: SmartPLS, 2024)

Hypothesis Analysis

The impact of Transactive Memory Systems (TMS) on Knowledge Management Systems (KMS) was tested in this study, and the results revealed a significant relationship. The hypothesis test showed a p-value of 0.00 and a t-value of 4.046, which indicates that the p-value is less than 0.05 and the t-value exceeds 1.96, confirming that TMS has a positive impact on KMS. The direction of influence is positive with a coefficient of 0.288, meaning that a one standard deviation increase in TMS leads to an average increase of 0.288 in the KMS sc ore.
The findings suggest that implementing TMS can enhance the use of KMS in organizations, allowing them to develop models for knowledge management based on TMS. Interviews with 11 universities also support this idea, indicating that while many universities have platforms for managing employee knowledge (such as knowledge creation, storage, and transfer), these platforms do not yet incorporate a transactive memory -based approach. In these institutions, knowledge is not systematically mapped according to individual expertise or coordinated both internally and externally to enhance credibility by leveraging faculty expertise. Additionally, the integration of Tridharma and independent learning activities has not been effectively facilitated by centralized platforms, as these processes still require manual operation across multiple departments.

The proposed KMS model, based on TMS, aims to address this gap by providing a structured approach to managingknowledge in educational institutions. It is expectedto enhance intellectual capital and canbe integrated with government systems for assessing Tridharma and administrative activities, particularly for lecturers. This research builds on previous studies that have linked TMS to knowledge management, particularly in the context of knowledge transfer, but with a broader focus on integrating a comprehensive KMS through a dedicated platform. Existing research (Akgün et al., 2005; Argote & Guo, 2016; X. Chen et al., 2013; Hong & Zhang, 2017; Huang et al., 2011; Jackson & Klobas, 2008; Jarvenpaa & Majchrzak, 2008; Mayr & Boenigk, 2019; Noroozi et al., 2013; Pullés et al., 2013; Spraggon & Bodolica, 2017; Wang et al., 2018; Wu & Deng, 2019; Zhang & Guo, 2019; Zhou et al., 2023) confirms that the integration of KMS with TMS can be effectively achieved using an integrated information system model structure.

Contextual Findings in Higher Education

Based on in-depth interviews with 11 universities, the following picture emerged:

1. Availability of Knowledge Management Platforms

All universities interviewed have knowledge management platforms that support the creation, storage, and transfer of knowledge. However, these systems arestill stand-alone and have not been integrated with Transactive Memory Systems (TMS) approaches that enable collaborative knowledge mapping and utilization.

2. Unstructured Mapping of Individual Expertise

Although faculty and staff profiledatais available, knowledgemappingbasedon individual expertiseremains partial and is not documented in a format that facilitates search or utilization. As a result, the potential of internal expertise has not been maximized optimally.

3. Suboptimal Internal and External Coordination

Coordination between units within the university, as well as with external partners (industry, government, research institutions), has not fully utilized the expertise of faculty and staff according to their areas of competence. This limitation is due to the lack of integration of expertise data with assignment and collaboration mechanisms.

4. Integration of Tridharma Activities and Merdeka Belajar Programs Not Yet Centralized

Educational, research, and community service activities, including the implementation of the Merdeka Belajar–Kampus Merdeka (MBKM) program, are not yet facilitated by a centralized system. Currently, activity management is still carried out manually across departments, resulting in suboptimal efficiency and coordination between divisions.

In-depth interviews with 11 universities revealed that although knowledge management platforms are available to support the creation, storage, and transfer of knowledge, these systems have not been integrated with the Transactive Memory Systems (TMS) approach as outlined in the University of Semarang's research through the development of an expertise search system (Abidin, Z., et al., 2021). Knowledge mapping based on individual expertise in higher education institutions is also not yet structured, in line with the findings of STAIN Gajah Putih, which highlight the importance of information validation and information technology support in expertise management (Fauzi, F. (2020). Internal-external coordination to leverage faculty expertise is not yet optimal, reinforcing previous research findings that emphasize organizational cultural barriers and limitations in technology integration in the implementation of KMS in higher education. Additionally, the integration of Tridharma activities and the Merdeka Belajar program is still conducted manually across departments without centralized system support.

CONCLUSION AND RECOMMENDATION

Based on the analysis results, this study concludes that the integration of Knowledge Management Systems (KMS) with Transactive Memory Systems (TMS) plays a strategic role in enhancing Intellectual Capital in higher education institutions. The Partial Least Squares–Structural Equation Modeling (PLS-SEM) test indicates that TMS has a positive and significant impact on KMS, which in turn becomes the primary driver for strengthening organizational intellectual capital. Although most universities already have knowledge management platforms, these systems have not beenintegrated with TMSapproaches, individual expertisemappingremains unstructured, internal–external coordination is not yet optimal, and the integration of Tridharma activities and the Merdeka Belajar program is still manual. Therefore, the proposed KMS–TMS integration model has the potential to serve as an innovative solution for effectively mapping, managing, and utilizing knowledge, while enhancing the competitiveness and performance of higher education institutions in the era of global knowledge-based competition.

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