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Digital Literacy, Self-Efficacy, And Leadership Support as Predictors of AI Tool Adoption in Higher Education: A Framework Validation Study

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Abstract

This study aimed to validate a proposed framework for Artificial Intelligence (AI) tool adoption among higher education faculty members by examining the influence of digital literacy, self-efficacy, and leadership support. Anchored on the Technology Acceptance Model (TAM), Social Cognitive Theory (SCT), and Organizational Support Theory (OST), the study explored how individual and organizational factors predict AI adoption in academic settings. A quantitative research design was employed using a survey questionnaire administered to 272 faculty members across campuses of the University of Perpetual Help System – JONELTA. The study measured digital literacy, self-efficacy, leadership support, and AI tool adoption using descriptive statistics, Pearson correlation, and multiple regression analysis. Results revealed that faculty members demonstrated a high level of digital literacy (WM = 3.48, SD = 0.499), moderate to high self-efficacy (WM = 3.33, SD = 0.569), and a moderate level of leadership support (WM = 2.99, SD = 0.812). AI tool adoption was likewise found to be at a moderate level (WM = 3.22, SD = 0.665). Correlation analysis showed significant positive relationships between digital literacy and AI tool adoption ($r = 0.647$, $p < 0.001$), self-efficacy and AI tool adoption ($r = 0.725$, $p < 0.001$), and leadership support and AI tool adoption ($r = 0.476$, $p < 0.001$). However, multiple regression analysis revealed that only self-efficacy ($\beta = 0.564$, $p < 0.001$) and leadership support ($\beta = 0.160$, $p < 0.001$) significantly predicted AI tool adoption, while digital literacy ($\beta = 0.093$, $p = 0.270$) did not emerge as a significant predictor when other variables were controlled. The model explained 54.5% of the variance in AI tool adoption ($R^2 = 0.545$), indicating a strong explanatory power. These findings suggest that while digital literacy is an important foundational competency, it does not directly drive AI adoption without the presence of strong self-efficacy and institutional support. Instead, faculty confidence in using AI tools and the level of leadership support play more critical roles in influencing actual adoption behavior. Based on these results, the study validated a comprehensive framework integrating individual and organizational determinants and proposed an action plan to enhance faculty readiness, strengthen leadership support systems, and promote sustainable and ethical AI integration in higher education. The study contributes to the growing body of knowledge on educational technology by providing an evidence-based model that can guide higher education institutions in fostering effective AI adoption among faculty members.

Keywords: Artificial Intelligence Tool Adoption; Self-Efficacy; Leadership Support; Digital Literacy; Higher Education; Technology Acceptance Model; Social Cognitive Theory; Organizational Support Theory

INTRODUCTION

In Higher Education (HE), Artificial Intelligence (AI) tools are increasingly integrated into academic practices, transforming teaching, learning, and administrative processes. Globally, AI adoption is recognized for its potential to enhance instructional delivery, support research, and improve institutional [23] [24]. However, effective AI adoption is not merely a technological issue; it is a socio-technical process shaped by faculty competencies, institutional culture, and organizational readiness, including leadership support, policy alignment, and faculty preparedness [22].

A substantial body of research emphasizes digital literacy (DL) as a foundational skill for successful AI adoption. Faculty members with higher digital literacy are more likely to perceive AI tools as useful and easy to use, which increases their behavioral intention to adopt these technologies [7] [27]. Framed within the Technology Acceptance Model (TAM), digital literacy positively influences perceived usefulness, perceived ease of use, and behavioral intention toward AI tools among teaching professionals [7].

Similarly, self-efficacy has been identified as a critical determinant of technology adoption. Faculty who are confident in their ability to learn and use AI tools are more likely to integrate these technologies effectively into teaching, research, and administrative tasks [9] [18].

Despite growing research on AI integration, several gaps remain. Most studies examine digital literacy, self-efficacy, or leadership support in isolation, limiting understanding of their combined influence on AI adoption. Few investigations adopt a holistic framework that simultaneously considers these factors as predictors of faculty adoption of AI tools. Existing literature often focuses on students or faculty separately, without fully accounting for interactions between individual readiness and institutional support mechanisms [12] [20].

While leadership support is acknowledged as a factor in promoting AI adoption [17] [3], its specific impact on faculty adoption behaviors, including guidance, professional development, and policy direction, remains underexplored. Furthermore, empirical studies explicitly linking AI literacy and teacher self-efficacy remain limited, and validated frameworks contextualized for higher education faculty are scarce [18] [9].

In response to these gaps, the present study positions AI adoption in higher education within a multi-layered framework integrating faculty digital literacy, self-efficacy, and leadership support. Drawing upon TAM, Social Cognitive Theory (SCT), and emerging AI literacy frameworks, this study examines how individual competencies and institutional mechanisms jointly influence faculty's effective use of AI tools in academic contexts.

This research seeks to validate a proposed framework in which digital literacy, self-efficacy, and leadership support serve as predictors of AI tool adoption among faculty members. Beyond contributing to theoretical knowledge, the study also aims to provide practical recommendations in the form of an Action Plan, guiding higher education leaders and policymakers in fostering effective, responsible, and sustainable AI integration. By linking empirical findings to actionable strategies, the study ensures that its outcomes are both evidence-based and implementable.

METHODOLOGY

This study employed a quantitative descriptive-correlational research design to examine and validate the factors influencing AI tool adoption among higher education faculty members. The design was appropriate because it enabled the researcher to determine the levels of digital literacy, self-efficacy, leadership support, and AI tool adoption, as well as examine the relationships and predictive influence among these variables.

The study was conducted at the University of Perpetual Help System – JONELTA across its six campuses located in Laguna, GMA, Manila, Pangasinan, Isabela, and Roxas. The respondents consisted of college faculty members actively involved in teaching and academic-related activities. The total population of the study was 921 faculty members. Using the Raosoft sample size calculator with a 5% margin of error, 95% confidence level, and 50% response distribution, a sample size of 272 respondents was obtained.

The study utilized stratified sampling technique to ensure proportional representation of respondents across the different campuses. Data were gathered using a self-made survey questionnaire composed of indicators related to digital literacy, self-efficacy, leadership support, and AI tool adoption. The instrument employed a four-point Likert scale to measure the respondents' perceptions and experiences regarding AI tool adoption.

For data analysis, weighted mean and standard deviation were used to determine the levels of the variables under study. Pearson Product-Moment Correlation was utilized to examine the relationships among variables, while Multiple Regression Analysis was employed to identify the significant predictors of AI tool adoption among higher education faculty members.

RESULTS AND DISCUSSION

Level of Digital Literacy

The findings revealed that faculty members demonstrated a Very High level of digital literacy with an overall weighted mean of 3.48 (SD = 0.499).

Table 1. Overall Level of Digital Literacy in AI Tool Adoption of HEI Faculty

Scale	Domains	*WM*	*SD*	Interpretation
Digital literacy	Technical skills	3.41	.534	Very High
	Information literacy	3.46	.547	Very High
	Digital ethics and safety awareness	3.56	.584	Very High
OVERALL		3.48	.499	Very High

Note. Scoring Range: 3.26 – 4.00 (Very High); 2.51 – 3.25 (High); 1.76 – 2.50 (Low); 1.00 – 1.75 (Very Low)

As shown in Table 1, the overall level of digital literacy among higher education faculty in terms of AI tool adoption is Very High, with an overall weighted mean of 3.48 and a standard deviation of 0.499, indicating a consistently strong level of digital competence across all domains. This finding reflects that faculty members possess well-developed skills and awareness necessary for effective engagement with digital and AI technologies in academic settings.

Among the three domains, digital ethics and safety awareness obtained the highest weighted mean (WM = 3.56, SD = 0.584), followed by information literacy (WM = 3.46, SD = 0.547), and technical skills (WM = 3.41, SD = 0.534). All indicators were interpreted as Very High, suggesting that respondents

demonstrate balanced competencies across operational, informational, and ethical dimensions of digital literacy.

This result is further supported by recent literature, which recognizes digital competence as a multidimensional construct that includes technical ability, information handling, communication, and awareness of safe technology use. Contemporary studies emphasize that these components work together to ensure effective participation in digital and AI-driven environments, particularly in higher education settings [14]. This suggests that digital literacy is not a single skill but a combination of interconnected competencies that support responsible and effective engagement with emerging technologies.

The strong performance in all three areas suggests that faculty members are well-prepared for the adoption of AI tools in teaching and academic tasks. Their competence in technical skills enables efficient use of digital platforms, while their information literacy supports effective evaluation and application of academic resources. Moreover, their high level of digital ethics and safety awareness ensures responsible and secure use of AI technologies, which is essential in modern educational environments.

The results indicate that University of Perpetual Help System – JONELTA faculty possess a strong and balanced level of digital literacy, which serves as a solid foundation for the successful adoption and integration of AI tools in higher education

Level of Self-Efficacy

The overall level of self-efficacy in adopting AI tools was interpreted as Very High with a weighted mean of 3.33 (SD = 0.569).

Table 2. Overall Level of Level of Self-Efficacy in Adopting AI Tools of HEI Faculty

Scale	Domains	*WM*	*SD*	Interpretation
Self-efficacy	Technological confidence	3.38	.572	Very High
	Confidence in using AI tools for teaching and academic work	3.33	.642	Very High
	Problem-solving confidence	3.27	.630	Very High
OVERALL		3.33	.569	Very High

Note. Scoring Range: 3.26 – 4.00 (Very High); 2.51 – 3.25 (High); 1.76 – 2.50 (Low); 1.00 – 1.75 (Very Low)

Table 2 presents the overall level of self-efficacy in adopting AI tools among higher education faculty is Very High, with an overall weighted mean of 3.33 and a standard deviation of 0.569, indicating a consistently strong sense of confidence in their ability to use AI technologies in academic settings. This finding supports contemporary social cognitive theory, which emphasizes that individuals with high self-efficacy are more likely to engage in tasks, persist through challenges, and perform effectively in technology-related activities [5].

Across the domains, technological confidence obtained the highest weighted mean (WM = 3.38, SD = 0.572), followed by confidence in using AI tools for teaching and academic work (WM = 3.33, SD = 0.642), and problem-solving confidence (WM = 3.27, SD = 0.630). All domains were interpreted as Very High, suggesting that faculty members possess balanced confidence across different aspects of AI tool utilization.

The strong level of technological confidence indicates that faculty members feel capable of using and adapting digital tools, which aligns with contemporary studies emphasizing that self-efficacy plays a key role in shaping individuals' willingness to use and engage with emerging technologies. Similarly, their high confidence in using AI tools for teaching and academic work reflects readiness to integrate AI into professional practice, consistent with recent technology adoption research showing that confidence significantly influences users' intention to adopt and actual use of digital and AI systems in educational contexts [28].

Furthermore, although still rated Very High, problem-solving confidence obtained the lowest weighted mean among the domains, suggesting that some faculty members may require additional support in troubleshooting and handling challenges related to AI use. In addition, self-efficacy in AI includes not only usage confidence but also the ability to navigate and resolve implementation challenges [2] [10].

In summary, the results indicate that faculty members possess a high and well-balanced level of self-efficacy, which serves as a strong foundation for the successful adoption and sustained use of AI tools in higher education.

Level of Leadership Support

Leadership support for AI tool adoption was interpreted as High with an overall weighted mean of 2.93 (SD = 0.812).

Table 3. Overall Level of Leadership Support for AI Tool Adoption in HEI Faculty

Scale	Domains	*WM*	*SD*	Interpretation
Leadership support	Administrative support	3.03	.757	High
	Professional development support	2.97	.802	High
	Policy and strategic direction	3.04	.793	High
	Technological infrastructure	2.93	.812	High
OVERALL		2.93	.812	High

Note. Scoring Range: 3.26 – 4.00 (Very High); 2.51 – 3.25 (High); 1.76 – 2.50 (Low); 1.00 – 1.75 (Very Low)

Table 3 shows the High overall level of leadership support for AI tool adoption among the faculty of University of Perpetual Help System - JONELTA. It has an overall weighted mean of 2.93 and a standard deviation of 0.812, indicating that institutions provide a generally supportive environment for AI integration, although there is still room for improvement in some areas. Thus, leadership plays a central role in driving digital transformation through strategic direction, institutional commitment, and provision of necessary resources [6][19].

Among the domains, Policy and Strategic Direction obtained the highest mean (WM = 3.04), followed by Administrative Support (WM = 3.03), both interpreted as High**,** suggesting that institutions are relatively stronger in providing governance frameworks and leadership encouragement for AI adoption. This supports UNESCO [17] and the World Economic Forum [26], which highlighted the importance of clear policies and leadership guidance in ensuring responsible and structured AI integration in education.

Meanwhile, Professional Development Support (WM = 2.97) and Technological Infrastructure (WM = 2.93) obtained the lowest means, though still interpreted as High, indicating that while training opportunities and infrastructure are present, they may not yet be fully sufficient to support advanced or

large-scale AI integration. Hence, effective AI adoption requires continuous investment in faculty development and strong technological systems [15][25].

In contrast, the results suggest that leadership support is moderately established across institutions, with stronger emphasis on policy and administrative encouragement than on infrastructure and professional development. This implies that while foundational support systems are in place, further strengthening is needed in training programs and technological resources to fully support sustainable AI adoption in higher education, as effective digital transformation requires both strong governance and continuous investment in human capacity and technological infrastructure [16][19].

These findings indicate that institutions provide moderate support for AI integration through policies, leadership encouragement, and training opportunities, although improvements are still needed in infrastructure and professional development.

Level of AI Tool Adoption

The overall level of AI tool adoption among faculty members was High with a weighted mean of 3.22 (SD = 0.665).

Table 4. Overall Level of AI Tools Adoption of HEI Faculty

Scale	Domains	*WM*	*SD*	Interpretation
AI Tools adoption	Actual use of AI tools	3.13	.776	High
	Perceived usefulness	3.26	.693	Very High
	Behavioral intention to use AI	3.27	.676	Very High
OVERALL		3.22	.665	High

Note. Scoring Range: 3.26 – 4.00 (Very High); 2.51 – 3.25 (High); 1.76 – 2.50 (Low); 1.00 – 1.75 (Very Low)

As shown in Table 4, the overall level of AI tool adoption among HEI faculty is High, with an overall weighted mean of 3.22 and a standard deviation of 0.665, indicating a generally strong but still developing integration of AI technologies in academic practice. This suggests that while faculty members are already engaging with AI tools and recognizing their value, full and consistent adoption across all dimensions is still evolving.

Across the domains, Behavioral Intention to Use AI obtained the highest weighted mean (WM = 3.27), followed closely by Perceived Usefulness (WM = 3.26), both interpreted as Very High, indicating that faculty members have a strong willingness to continue using and expanding their engagement with AI tools. This aligns with recent studies on technology adoption, which emphasize that behavioral intention is a key predictor of actual technology use, where stronger intentions lead to higher likelihood of sustained adoption in educational settings [4][13].

In contrast, Actual Use of AI Tools recorded the lowest weighted mean (WM = 3.13), interpreted as High, suggesting that while faculty members strongly value and intend to use AI tools, their actual usage is still comparatively moderate. This pattern is consistent with recent findings that explain technology adoption as a gradual process where positive perceptions and behavioral intentions often precede full and consistent integration of digital and AI tools in academic practice [7][30].

The results indicate that faculty members recognize the usefulness of AI tools and demonstrate strong willingness to continue using them, although actual usage is still developing.

Relationship Between Variables and AI Tool Adoption

Pearson correlation analysis revealed significant positive relationships between the independent variables and AI tool adoption as shown in Table 5:

Table 5. Relationship between the Level of Digital Literacy, Self-efficacy, and Leadership Support and Level of AI Tools Adoption of HEI Faculty

Independent	Dependent	Pearson's r^a	*p*-value	*Interpretation*
Digital literacy	AI tools adoption	.647, (strong)	< .001	Significant
Self-efficacy	AI tools adoption	.725, (strong)	< .001	Significant
Leadership support	AI tools adoption	.476, (moderate)	< .001	Significant

Pearson Product-Moment Correlation analysis revealed significant positive relationships between digital literacy, self-efficacy, leadership support, and AI tool adoption among HEI faculty. The findings indicate that higher levels of these variables are associated with higher levels of AI tool adoption.

Digital literacy showed a strong positive relationship with AI tool adoption ($r = 0.647$, $p < .001$), indicating that faculty members with stronger digital skills, information literacy, and digital ethics awareness are more likely to utilize AI tools in teaching and academic tasks. This finding supports previous studies which emphasized that individuals with higher digital competence are more capable of adopting and integrating emerging technologies in educational environments [1][11].

Among the variables, self-efficacy demonstrated the strongest relationship with AI tool adoption ($r = 0.725$, $p < .001$). This suggests that faculty confidence in their ability to use AI technologies greatly influences their willingness and actual engagement with AI tools. The finding is consistent with Social Cognitive Theory, which explains that individuals with higher self-efficacy are more likely to engage successfully in technology-related tasks and persist despite challenges [5].

Meanwhile, leadership support showed a moderate positive relationship with AI tool adoption ($r = 0.476$, $p < .001$), highlighting the importance of institutional policies, administrative encouragement, training opportunities, and technological resources in supporting AI integration. This suggests that supportive leadership and organizational readiness contribute significantly to faculty adoption of AI technologies in higher education settings [6][31].

The findings imply that digital literacy, self-efficacy, and leadership support are important factors associated with AI tool adoption among faculty members. Faculty members who are digitally competent, confident in using AI technologies, and supported by their institutions are more likely to integrate AI tools into their academic and professional practices.

Table 6. Model Summary of the Combined Predictive Power of the Level of Digital Literacy, Level of Self-Efficacy and Level of Leadership Support on the Level of AI Tools Adoption of HEI Faculty

Model	R^2	Adj. R^2	*F*	df	*p*-value	Interpretation
1	.545	.540	107.049	3, 268	<.001	Significant

Note. Predictors: (Constant) digital literacy, self-efficacy, leadership support; Dependent Variable: AI tools adoption

Table 6 shows that the regression model explained 54.5% of the variance in AI tool adoption ($R^2 = 0.545$), indicating that digital literacy, self-efficacy, and leadership support collectively contributed to explaining faculty adoption of AI tools. This suggests that the model has a strong explanatory power in determining AI tool adoption among faculty members. However, the remaining 45.5% of the variance may be attributed to other factors not included in the study.

Predictors of AI Tool Adoption

Table 7. Predictive Power of the Level of Digital Literacy, Level of Self-Efficacy and Level of Leadership Support on the Level of AI Tools Adoption of HEI Faculty

Predictors	B	SE	Beta (β)	*p*-value	Interpretation
Digital literacy	.124	.112	.093	.270	Not Significant
Self-efficacy	.659	.104	.564	<.001	Significant
Leadership support	.131	.039	.160	.001	Significant

Note. Dependent Variable: AI tools adoption

Table 7 presents the results of the multiple regression analysis examining the predictive power of digital literacy, self-efficacy, and leadership support on AI tools adoption among HEI faculty. The findings revealed that self-efficacy (B = .659, β = .564, p < .001) and leadership support (B = .131, β = .160, p = .001) significantly predicted AI tools adoption, leading to the rejection of the null hypothesis for both variables. These results indicate that faculty members who possess stronger confidence in their ability to use AI tools, as well as those who receive greater institutional and administrative support, are more likely to adopt AI technologies in their academic work.

Among the predictors, self-efficacy emerged as the strongest predictor, suggesting that confidence in using AI tools plays the most influential role in determining actual adoption behavior. In contrast, digital literacy (B = .124, β = .093, p = .270) did not significantly predict AI tools adoption, resulting in the failure to reject the null hypothesis. Although digital literacy showed a significant relationship with AI tool adoption in the correlation analysis, its predictive influence became insignificant when self-efficacy and leadership support were simultaneously included in the regression model. This suggests that digital literacy alone is not sufficient to directly influence actual AI adoption behavior. The findings imply that while digital literacy provides faculty members with the foundational knowledge and technical skills needed to access and use digital technologies, it is self-efficacy that transforms these competencies into actual usage behavior. Faculty members may possess adequate digital skills, but without confidence in their ability to effectively utilize AI tools, adoption may remain limited. Likewise, leadership support functions as an important external factor that facilitates adoption through institutional policies, infrastructure, training opportunities, and administrative encouragement.

These results are supported by Social Cognitive Theory, which emphasizes that individuals' beliefs in their capabilities significantly influence their actions and persistence in performing technology-related tasks. Similarly, recent studies on technology adoption highlight that behavioral intention and actual use are more strongly influenced by psychological readiness and facilitating conditions than by technical competence alone. Thus, the study confirms that self-efficacy and leadership support are more immediate and influential determinants of AI tool adoption than digital literacy.

The findings further suggest that although digital literacy is significantly associated with AI tool adoption, it may not directly predict actual technology use when other factors are considered simultaneously.

Contemporary studies indicate that digital literacy often operates through mediating variables such as self-efficacy and facilitating conditions rather than functioning as an independent predictor of adoption behavior [8]. This implies that while digital literacy provides the foundational knowledge and skills necessary for AI adoption, faculty confidence and institutional support play more immediate roles in transforming digital competence into actual AI tool usage.

CONCLUSION/RECOMMENDATIONS

The study concluded that faculty members of the University of Perpetual Help System – JONELTA possess very high levels of digital literacy and self-efficacy, while leadership support and AI tool adoption were generally high.

The findings confirmed that digital literacy, self-efficacy, and leadership support are significantly associated with AI tool adoption. However, among these variables, only self-efficacy and leadership support significantly predicted AI tool adoption.

The study further concludes that faculty confidence in using AI technologies and strong institutional support systems are essential factors in promoting sustainable AI integration in higher education. While digital literacy provides the foundational skills necessary for AI use, it is not sufficient alone to drive adoption without confidence and organizational support.

Overall, the study validated the proposed framework integrating individual and organizational determinants of AI tool adoption in higher education.

Based on the findings of the study, the following recommendations are proposed:

1. Higher education institutions should strengthen faculty self-efficacy through continuous AI-related training, mentoring, and hands-on workshops.
2. Institutional leaders should provide stronger administrative and organizational support by improving policies, incentives, and recognition systems for AI integration.
3. Universities should enhance technological infrastructure, including access to AI platforms, software, hardware, and reliable internet connectivity.
4. Professional development programs focusing on instructional design and AI integration strategies should be implemented.
5. Institutions should establish clear ethical guidelines and strategic plans for sustainable and responsible AI use in education.
6. Future researchers may further validate the framework using different educational settings, additional variables, or mixed-method research designs.

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