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Article

AN EXTENDED TECHNOLOGY ACCEPTANCE MODEL OF ONLINE PROFESSIONAL DEVELOPMENT FOR MATHEMATICS TEACHERS: A PARTIAL LEAST SQUARE – STRUCTURAL EQUATION MODELING

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Abstract: digitally mediated and flexible learning environments. This study examines teachers' acceptance of OPD using an extended Technology Acceptance Model (TAM), incorporating digital self-efficacy and job relevance as key antecedents of perceived ease of use and perceived usefulness. A quantitative design was employed, with data collected from 177 mathematics teachers in the Province of Aklan, Philippines, and analyzed using partial least squares structural equation modeling (PLS-SEM). The findings indicate that digital self-efficacy significantly strengthens perceived ease of use, while both perceived ease of use and job relevance significantly contribute to perceived usefulness. Perceived usefulness emerged as the most influential determinant of behavioral intention, whereas perceived ease of use did not have a significant direct effect, suggesting that teachers prioritize functional value over usability in their adoption decisions. These results underscore the importance of aligning OPD with teachers' instructional needs and enhancing their digital competencies to foster sustained engagement. The study extends TAM within the context of professional development and contributes empirical evidence from a developing country setting, offering practical insights for the design of context-responsive OPD initiatives.

1. INTRODUCTION

The rapid integration of digital technologies in education has transformed teacher professional development into more flexible, accessible, and scalable forms, particularly through online professional development (OPD). OPD enables teachers to engage in continuous learning independent of time and location constraints, addressing long-standing issues of access and participation in traditional training models. This shift was significantly accelerated during the COVID-19 pandemic, which disrupted face-to-face training and necessitated the rapid adoption of digital platforms for teacher learning. Evidence suggests that OPD became a critical mechanism for sustaining teacher development during this period, enabling continuity of professional learning despite institutional closures [1]. Furthermore, recent studies indicate that OPD can produce meaningful improvements in instructional practices and teacher competencies when effectively designed and implemented [2], reinforcing its long-term relevance in post-pandemic education systems.

A key factor influencing OPD implementation is teachers' acceptance of technology, which has been widely explained using the Technology Acceptance Model (TAM). TAM proposes that perceived usefulness and perceived ease of use are primary determinants of behavioral intention to use a system [3]. Numerous studies have validated TAM in educational settings, demonstrating that teachers' perceptions significantly influence their intention to adopt

digital tools [4]. For instance, recent research confirms that perceived usefulness and ease of use strongly predict teachers' behavioral intention to use ICT, reinforcing TAM's applicability in teaching contexts [5]. These findings highlight the continued relevance of TAM in explaining technology adoption in education.

However, prior TAM-based studies exhibit several limitations. Many investigations focus on general technology use rather than specific professional development platforms, limiting their explanatory power in OPD contexts. Furthermore, existing research often overlooks contextual variables that shape teachers' engagement with digital learning systems. A systematic review of technology acceptance studies notes that while TAM remains robust, it frequently underrepresents contextual and psychological factors relevant to professional learning environments [6]. Similarly, studies conducted in developing countries reveal that infrastructure, digital readiness, and contextual constraints significantly affect adoption outcomes [7].

To address these gaps, recent studies have extended TAM by incorporating constructs such as digital self-efficacy and job relevance. Digital self-efficacy reflects teachers' confidence in using technology and has been shown to significantly influence perceived ease of use and adoption behavior across multiple contexts [8]. Meanwhile, job relevance captures the extent to which technology aligns with professional tasks, directly influencing perceived usefulness [9]. Empirical studies demonstrate that integrating these variables enhances the explanatory power of TAM in educational technology adoption [10]. These extensions are particularly important in OPD settings, where both individual competence and professional alignment shape engagement.

Parallel to TAM research, the OPD literature has expanded rapidly, emphasizing its role in improving teacher competencies and instructional practices. Studies indicate that OPD supports collaborative learning, reflective practice, and sustained professional growth, especially when designed with interactive and context-specific features [11]. A systematic review further highlights that effective OPD programs must integrate institutional support, pedagogical design, and technological infrastructure to achieve meaningful outcomes [12]. Additionally, recent analyses stress that OPD effectiveness depends not only on program design but also on teachers' attitudes and readiness to adopt digital learning tools [13].

Despite these developments, there remains limited integration of TAM with OPD in empirical research. Most OPD studies focus on program effectiveness rather than examining behavioral acceptance mechanisms, while TAM studies often lack contextual grounding in professional development settings. Recent research using structural equation modeling suggests a shift toward predictive models that capture both behavioral and contextual determinants of technology use [14]. However, there is still a need for studies that combine TAM with OPD-specific variables and analyze these relationships using robust analytical techniques such as Partial Least Squares Structural Equation Modeling (PLS-SEM).

This study addresses these gaps by examining mathematics teachers' acceptance of OPD using an extended TAM framework and employing PLS-SEM for predictive analysis. By integrating digital self-efficacy and job relevance with core TAM constructs, the study provides a more comprehensive understanding of OPD adoption. Focusing on teachers in the Philippines, it contributes context-specific evidence to a field dominated by studies from developed countries. The findings are expected to advance theory by refining TAM in professional learning contexts and to inform the design of user-centered, relevant, and scalable OPD systems that support sustained teacher engagement.

This study specifically aimed to test the following hypotheses:

H1: Digital self-efficacy has a significant positive effect on perceived ease of use of online professional development.

H2: Perceived ease of use has a significant positive effect on perceived usefulness of online professional development.

H3: Job relevance has a significant positive effect on perceived usefulness of online professional development.

H4: Perceived usefulness has a significant positive effect on teachers' behavioral intention to use online professional development.

H5: Perceived ease of use has a significant positive effect on teachers' behavioral intention to use online professional development.

1.1. Review of Related Literature

H1. Research shows that digital self-efficacy strongly influences how users perceive the ease of using digital systems, with higher confidence leading to greater perceived ease of use [15]. Among teachers, those with stronger digital skills are more likely to find online platforms easier to navigate and use for professional learning [16]. Studies in e-learning also confirm that self-efficacy reduces perceived complexity and improves user interaction with technology [17]. Moreover, recent findings indicate that digital self-efficacy remains a key predictor of perceived ease of use in online learning and professional development environments [10].

H2. Perceived ease of use is a key determinant of perceived usefulness, as systems that require less effort are more likely to be considered beneficial for accomplishing professional tasks [18]. In educational settings, teachers who find online platforms easy to use tend to recognize their value in improving instructional practices and supporting professional development activities [19], [17]. Evidence from e-learning research further shows that reduced complexity enhances users' perceptions of usefulness by enabling more efficient interaction with digital learning environments [20], [13].

H3. Alignment between a technology and users' professional tasks plays a crucial role in shaping its perceived value, as systems that directly support work-related responsibilities are more likely to be regarded as useful in practice [9], [10]. In teacher professional development contexts, when online learning activities closely match instructional needs and classroom demands, educators are more inclined to recognize their usefulness for improving teaching effectiveness and professional performance [11], [2].

H4. Perceived usefulness is widely recognized as a central driver of behavioral intention, as individuals are more likely to adopt systems they believe will enhance their performance and productivity [21]. In educational contexts, teachers who perceive online professional development as beneficial to their instructional practice are more inclined to continue using such platforms [22], [23]. Empirical studies further demonstrate that perceived usefulness strongly predicts sustained engagement in digital learning environments, particularly when users experience tangible improvements in their professional outcomes [24], [13]. This relationship underscores the importance of demonstrating clear value and practical benefits in OPD systems to encourage long-term adoption among educators [7], [13].

H5. Ease of use directly influences behavioral intention, as users tend to adopt technologies that are simple to learn and operate with minimal effort [25], [26]. In teaching environments, systems that are perceived as user-friendly reduce resistance to adoption and increase teachers' willingness to engage with online platforms [27], [28]. Moreover, evidence suggests that lower complexity enhances confidence and motivation, thereby strengthening teachers' intention to use digital professional development tools [29], [30].

2. METHOD

2.1. Respondents' Demographic Characteristics

Sample size adequacy was assessed using statistical power analysis [31]. With a maximum of two predictors for any endogenous construct, a minimum sample size of 157 was required to detect small-to-medium effect sizes ($f^2 = 0.10$) at a 95% power level and $\alpha = .05$. The actual sample of 177 mathematics teachers exceeds this requirement, indicating that the study has sufficient statistical power and robustness for model estimation [32].

The majority of the mathematics teachers are female (80.23%) and are primarily affiliated with public institutions (80.23%), suggesting a strong representation of the public education sector in the sample. In terms of teaching level, most respondents are from the secondary level (48.59%), followed by elementary (40.68%), with a smaller proportion from tertiary education (10.73%). The age distribution shows that a large proportion of teachers fall within the 20–39 age range, indicating a relatively young and active workforce, while teaching experience is fairly distributed, with the highest concentration in the 4–9 years category, reflecting early to mid-career professionals. Regarding professional development engagement, nearly half of the respondents reported attending 1–3 online professional development (OPD) activities, with asynchronous online courses and synchronous workshops emerging as the most commonly utilized formats. This pattern suggests that teachers prefer flexible and accessible learning modalities, while also engaging in interactive learning environments, highlighting a balanced approach to professional development in the digital context.

Data Collection

Data collection was conducted during the third week of January to the second week of February 2026 using a structured online questionnaire administered through Google Forms. The survey link was disseminated to teachers through institutional communication channels and professional networks to ensure broad and efficient reach. Prior to accessing the questionnaire, respondents were presented with an informed consent statement outlining the purpose of the study, the voluntary nature of participation, and their rights as participants. Only those who explicitly indicated their willingness to participate were allowed to proceed with the survey, ensuring that all responses were obtained with informed consent.

Ethical standards were rigorously upheld throughout the data collection process. Participants were assured that their responses would remain strictly confidential and anonymous, and no personally identifiable information was collected at any stage. They were also informed of their right to withdraw from the study at any point without any form of penalty. Following data collection, the dataset underwent a systematic screening process to ensure quality and reliability. Responses with substantial missing data, implausibly short completion times, or evident response patterns were excluded. This data cleaning procedure ensured that only valid, complete, and reliable responses were included in the final analysis, thereby strengthening the integrity of the study's findings.

Research Instruments

The research instrument was adapted from established measures grounded in the Technology Acceptance Model (TAM) and its extensions, ensuring content validity and theoretical alignment with the constructs under investigation. Modifications were made to contextualize the items within online professional development (OPD) for teachers. The questionnaire utilized a 5-point Likert scale, where 1 = strongly disagree and 5 = strongly agree, to capture respondents' level of agreement with each statement. Following measurement model evaluation, certain items were removed to address discriminant validity concerns, particularly cross-loadings, thereby improving the overall psychometric quality of the instrument.

Perceived Usefulness (PU) Scale

The items in Perceived Usefulness were adapted from the work of Davis [33], capturing the extent to which teachers perceive OPD as beneficial to their instructional performance and professional effectiveness. All four items were retained, as they demonstrated strong outer loadings and contributed to adequate convergent validity, indicating that the construct was well-represented in the model.

Perceived Ease of Use (PEOU) Scale

The Perceived Ease of Use construct was likewise derived from Davis [33], focusing on teachers' perceptions of the effort required to use OPD platforms. The four items were retained, reflecting clarity, ease of interaction, and skill acquisition in using digital systems. The retained indicators exhibited satisfactory reliability and validity, supporting the robustness of the construct.

Behavioral Intention (BI) Scale

For Behavioral Intention, items were adapted from Venkatesh et al. [34], representing teachers' intention to adopt and continue using OPD. However, Items 3 and 4 were removed due to high cross-loadings with other constructs, which threatened discriminant validity. The remaining two items were retained as they demonstrated strong loadings and adequately captured the core intention to use OPD.

Digital Self-Efficacy (DSE) Scale

The Digital Self-Efficacy construct was based on Compeau and Higgins [35], measuring teachers' confidence in their ability to use digital tools and platforms. All four items were retained, as they consistently exhibited strong loadings and contributed to high internal consistency reliability, indicating that the construct effectively captures teachers' perceived digital competence in the OPD context.

Job Relevance (JR) Scale

Job Relevance was adapted from Venkatesh and Davis [9], reflecting the degree to which OPD aligns with teachers' professional tasks and instructional needs. Item 2 was removed due to cross-loading issues that compromised discriminant validity. The remaining three items were retained, as they demonstrated acceptable psychometric properties and sufficiently represented the construct.

Data Analysis

Data analysis was performed using partial least squares structural equation modeling (PLS-SEM) in SmartPLS 4, selected for its suitability in predictive and complex model analysis. The procedure began with preliminary data screening, including descriptive statistics, normality test, assessment of missing values, and detection of outliers to ensure data quality [36], [32]. The measurement model was then evaluated by examining indicator reliability, internal consistency (Cronbach's alpha and composite reliability), convergent validity (average variance extracted), and discriminant validity using the heterotrait–monotrait (HTMT) ratio [36], [32].

The structural model assessment included testing for collinearity using variance inflation factors (VIF) and evaluating path coefficients through bootstrapping to determine statistical significance [36], [32]. Model explanatory power was assessed using the coefficient of determination (R^2), while predictive performance was evaluated using PLSpredict, incorporating both root mean square error (RMSE) comparisons with a naïve linear model and Q^2predict values to assess out-of-sample predictive relevance [14].

3. RESULTS AND DISCUSSION

3.1. Preliminary Analysis

Prior to hypothesis testing, normality was assessed using skewness and kurtosis tests through Mardia's multivariate normality test, and the results indicated that both skewness (Test Statistic = 3559.712, p = .000) and excess kurtosis (Test Statistic = 21.841, p = .000) were statistically significant, suggesting that the data do not follow a normal distribution. This indicates the presence of asymmetry and non-normality in the dataset. Thus, Partial Least Squares Structural Equation Modeling (PLS-SEM) was employed, which does not require normally distributed data and is robust to violations of normality assumptions [27].

3.2. Measurement Model Assessment

3.2.1. Reliability and Convergent Validity

The reliability and validity of the measurement model were established using outer loadings, Cronbach's alpha, composite reliability, and average variance extracted (AVE), as shown in Table 1. All indicator loadings ranged from 0.872 to 0.921, exceeding the recommended threshold of 0.70 and indicating strong indicator reliability [36], [32]. Likewise, Cronbach's alpha (0.793–0.930) and composite reliability (0.800–0.930) values surpassed the minimum requirement of 0.70, confirming satisfactory internal consistency [32]. Furthermore, AVE values (0.790–0.826) were above the 0.50 threshold, demonstrating adequate convergent validity [32]; overall, these results confirm that the measurement model is reliable and suitable for further structural analysis.

Table 1. Outer Loadings, Cronbach's Alpha, Composite Reliability, and AVE

	Items Retained	Outer Loadings	Cronbach's alpha	Composite reliability	Average variance extracted (AVE)
Behavioral Intention	B1	0.899	0.793	0.800	0.828
	B2	0.921			
Digital Self-Efficacy	DSE1	0.876	0.911	0.912	0.790
	DSE2	0.872			
	DSE3	0.894			
	DSE4	0.912			
Job Relevance	JR1	0.896	0.888	0.889	0.817

	JR3	0.909			
	JR4	0.907			
Perceived Ease of Use	PEOU2	0.909	0.914	0.918	0.794
	PEOU1	0.875			
	PEOU3	0.877			
	PEOU4	0.903			
Perceived Usefulness	PU1	0.912	0.930	0.930	0.826
	PU2	0.908			
	PU3	0.903			
	PU4	0.913			

3.2.2. Discriminant Validity

Discriminant validity was assessed using the Heterotrait–Monotrait ratio of correlations (HTMT). As shown in Table 2, all HTMT values were below the conservative threshold of 0.85, indicating that the constructs are empirically distinct from one another [37]. The highest HTMT value was observed between Behavioral Intention and Job Relevance (0.827), which, although relatively high, remains within the acceptable range and suggests only a moderate association between the two constructs.

Table 2. The Fornell-Larcker Criterion and Heterotrait–Monotrait ratio of correlations (HTMT)

	Behavioral Intention	Digital Self-Efficacy	Job Relevance	Perceived Ease of Use	Perceived Usefulness
Behavioral Intention					
Digital Self-Efficacy	0.78				
Job Relevance	0.827	0.807			
Perceived Ease of Use	0.631	0.815	0.616		
Perceived Usefulness	0.815	0.784	0.803	0.711	

Structural Model Assessment

Collinearity diagnostics indicate that all VIF values fall within acceptable limits (1.000–1.788), suggesting the absence of critical multicollinearity issues among the indicators and supporting the stability of the measurement model [27].

The model demonstrates meaningful explanatory power for the endogenous constructs. The R^2 values indicate that the model explains 50.3% of the variance in behavioral intention, 55.7% in perceived ease of use, and 62.7% in perceived usefulness, reflecting moderate explanatory capacity across the constructs [32]. Moreover, the PLSpredict results indicate that the model has strong out-of-sample predictive relevance, as all Q^2predict values are substantially greater than zero and exceed the threshold for strong predictive power (BI = 0.520, PEOU = 0.555, PU = 0.600). In addition, the RMSE and MAE values are relatively low and consistent across constructs, suggesting acceptable prediction errors and stable predictive performance. These demonstrate that the model has good predictive capability and can reliably generalize beyond the sample data [14], [36].

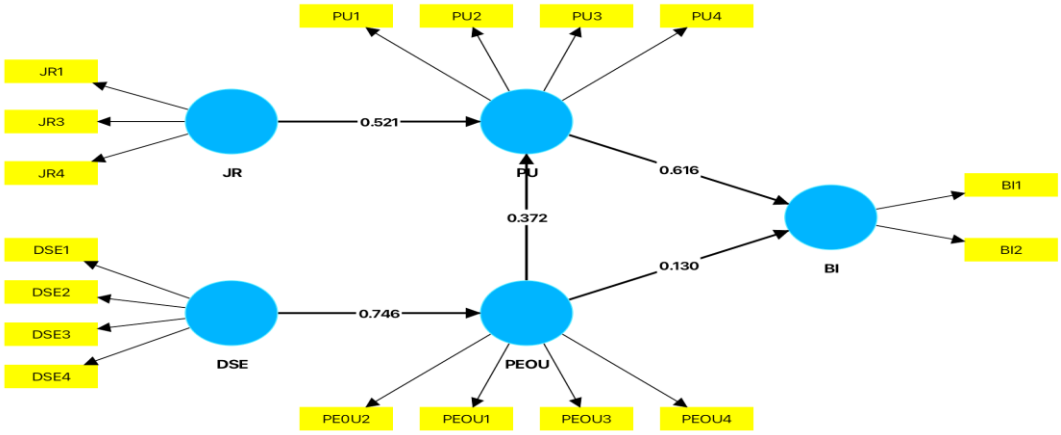

Figure 1. The model showing the path coefficients

The Path Coefficients

H1: Digital self-efficacy has a significant positive effect on perceived ease of use of online professional development.

The results in Table 3 reveal that digital self-efficacy has a strong and significant positive effect on perceived ease of use ($\beta = 0.746$, $p = 0.000$), indicating that mathematics teachers who are more confident in their digital capabilities are more likely to perceive online professional development (OPD) platforms as easy to use, which supports H1. This finding is consistent with recent empirical evidence showing that digital self-efficacy significantly enhances perceived ease of use in technology adoption models, as users with higher confidence experience less difficulty in interacting with digital systems [38]. In educational contexts, teachers with stronger digital self-efficacy demonstrate better ability to navigate online platforms, which improves their perception of usability and reduces barriers to technology adoption [39]. Moreover, research in digital learning environments confirms that self-efficacy plays a crucial role in shaping usability perceptions by enabling users to manage technological tasks more efficiently and independently [40].

Digital self-efficacy is a dominant predictor of perceived ease of use in OPD settings, highlighting the importance of individual capability in shaping technology perceptions. This is supported by findings that individuals with higher self-efficacy are more likely to engage with and adapt to digital learning systems, thereby reducing perceived effort and increasing usability perceptions [41]. In professional development contexts, this implies that teachers who are confident in using digital tools are more likely to experience OPD platforms as user-friendly and manageable, which facilitates their engagement and continued use [42]. Consequently, strengthening mathematics teachers' digital self-efficacy through targeted training and institutional support is essential for improving perceived ease of use and promoting the successful adoption of online professional development systems [38].

Table 3. The Direct Effect of each path

	β	T statistics	P values	Description
DSE -> PEOU	0.746	16.460	0.000	Supported
JR -> PU	0.521	8.196	0.000	Supported
PEOU -> BI	0.130	1.845	0.065	Not Supported
PEOU -> PU	0.372	6.087	0.000	Supported
PU -> BI	0.616	8.731	0.000	Supported

H2: Perceived ease of use has a significant positive effect on perceived usefulness of online professional development.

Perceived ease of use has a significant positive effect on perceived usefulness ($\beta = 0.372$, $p < 0.000$), suggesting that mathematics teachers who find online professional development (OPD) platforms easy to use are more likely to perceive them as useful. This finding is consistent with extended TAM research showing that ease of use enhances perceived usefulness by lowering effort and improving task efficiency in digital environments [18]. In educational settings, systems that are intuitive and require minimal technical effort enable users to focus on learning outcomes, thereby strengthening their perception of usefulness [4].

The relationship between perceived ease of use and perceived usefulness is particularly relevant in OPD contexts, where teachers often balance multiple professional responsibilities. Evidence indicates that when digital platforms are simple to navigate, users experience reduced cognitive load, which enhances their ability to engage with content and recognize its value [17]. In technology-enhanced learning environments, ease of use facilitates smoother interaction and increases perceived benefits, especially for users with varying levels of digital competence [13].

Moreover, ease of use contributes significantly to perceived usefulness, it operates alongside other contextual and motivational factors. Prior research confirms that usability alone is not sufficient; rather, it works in combination with relevance, content quality, and user experience to shape overall perceptions of usefulness [43]. Therefore, designing OPD platforms that are both user-friendly and aligned with math teachers' professional needs is essential for maximizing perceived usefulness and encouraging sustained engagement [44].

H3: Job relevance has a significant positive effect on perceived usefulness of online professional development.

The results also show that job relevance has a significant positive effect on perceived usefulness ($\beta = 0.521$, $p = 0.000$), indicating that mathematics teachers are more likely to perceive online professional development (OPD) as useful when it is directly aligned with their instructional tasks and professional responsibilities [6]. This suggests that the closer the connection between OPD content and teachers' actual work, the more value they assign to the platform, as technologies that directly support job performance are more likely to be perceived as useful [45], [10]. This finding is further supported by recent studies showing that job relevance significantly enhances perceived usefulness in technology adoption, particularly when systems improve efficiency and task performance in professional settings [7], [46].

Job relevance is also a critical factor in shaping teachers' perceptions of OPD effectiveness [47]. When online learning activities address real classroom needs and instructional challenges, mathematics teachers are more likely to recognize their practical benefits and integrate them into their teaching practice [48], [49]. This aligns with empirical evidence demonstrating that alignment between digital learning systems and job-related tasks strengthens perceived usefulness and promotes sustained engagement in professional development contexts [2], [45].

H4: Perceived usefulness has a significant positive effect on teachers' behavioral intention to use online professional development.

Mathematics teachers' intention to use online professional development (OPD) is strongly influenced by how useful they perceive the platform to be, as reflected in the significant path from perceived usefulness to behavioral intention ($\beta = 0.616$, $p < 0.000$). When teachers believe that OPD can enhance their teaching effectiveness and professional growth, they are more likely to adopt and continuously use such platforms, which aligns with evidence that perceived usefulness is a primary determinant of technology adoption behavior [45], [7]. This relationship highlights that the perceived benefits of a system play a central role in shaping users' willingness to engage with digital learning environments, particularly in professional contexts where performance improvement is essential [10], [47].

The result further indicates that perceived usefulness is a key driver of sustained engagement in OPD systems. In practice, teachers tend to prioritize platforms that demonstrate clear and immediate value in addressing instructional needs and improving classroom outcomes, reinforcing their intention to use such technologies [50], [2]. This is consistent with recent findings showing that perceived usefulness not only influences initial adoption but also supports continued usage by reinforcing the practical value of digital professional development tools [44], [51].

H5: Perceived ease of use has a significant positive effect on teachers' behavioral intention to use online professional development.

The findings indicate that perceived ease of use does not have a significant effect on math teachers' behavioral intention to use online professional development ($\beta = 0.130$, $p = 0.065$), suggesting that ease of use alone is not a

decisive factor in influencing teachers' adoption decisions. This implies that even if OPD platforms are user-friendly, teachers may not necessarily intend to use them unless they perceive clear benefits or relevance to their professional needs, which is consistent with studies showing that perceived usefulness often outweighs ease of use in predicting behavioral intention [47], [45]. In many educational technology contexts, ease of use is considered a facilitating condition rather than a primary driver, particularly when users are already familiar with digital tools [52].

The non-significant relationship may also reflect the increasing digital competence of teachers, where ease of use is no longer a major barrier to technology adoption [53]. As teachers become more experienced with digital platforms, their decisions are more strongly influenced by the value and outcomes of the technology rather than its usability features [54], [55]. This aligns with recent findings suggesting that perceived ease of use has a diminishing direct effect on behavioral intention in mature technology environments, where users prioritize functionality and relevance over simplicity [56], [57].

4. CONCLUSION

This study advances the understanding of technology adoption in teacher professional development by demonstrating that acceptance of online professional development (OPD) is better explained through a value-driven rather than a usability-driven lens. The findings suggest that in increasingly digitalized teaching environments, ease of use is no longer sufficient to drive adoption; instead, mathematics teachers prioritize systems that clearly enhance their instructional effectiveness and professional growth. This shift underscores the need to reconceptualize OPD design from a purely technological perspective toward one that foregrounds pedagogical relevance and practical impact.

From a practical standpoint, the study highlights the importance of aligning OPD initiatives with the mathematics teachers' actual classroom needs and professional responsibilities. Educational leaders and program designers should focus on curating context-specific, outcome-oriented content while simultaneously strengthening math teachers' digital self-efficacy through sustained capacity-building efforts. Rather than investing solely in platform usability, institutions should adopt a more strategic approach that integrates technical support, relevant content design, and continuous professional engagement to ensure long-term adoption and meaningful learning experiences.

The study also contributes theoretically by extending the Technology Acceptance Model within a professional development context for mathematics teachers, demonstrating that contextual and individual factors must be considered alongside core technological perceptions. It provides empirical support for the evolving role of perceived usefulness as the dominant driver of behavioral intention, while also illustrating the diminishing direct influence of perceived ease of use in mature digital environments. These insights contribute to ongoing discussions on the evolution of technology acceptance models in mathematics education, particularly in relation to shifting user expectations and increasing digital familiarity among teachers.

Beyond its theoretical contributions, this study offers significant contextual value by providing evidence from a developing country setting, where issues of access, readiness, and relevance intersect in complex ways. It responds to the limited representation of such contexts in technology acceptance research and offers a grounded perspective that can inform both local and international policy directions. Overall, the study underscores that successful OPD implementation requires a holistic approach, one that integrates technological design, user capability, and contextual relevance, to support sustainable and impactful mathematics teacher development in the digital age.

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CONFLICT OF INTEREST STATEMENT

Author state no conflict of interest.

DATA AVAILABILITY

The data that support the findings of this study are available on request from the corresponding author, Malonisio, M. O. The data, which contain information that could compromise the privacy of research participants, are not publicly available due to certain restrictions.

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