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Investigating EFL Teachers' Technology Adoption Level of ICT Integration by Using the Extended Technology Acceptance Model: A Study of MGMP Bahasa Inggris in Kutai Kartanegara

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Annisa[1], Bibit Suhatmady[2], Desy Rusmawaty[3]
Mulawarman University, Indonesia
annisa32.02@gmail.com[1], bibitsuhatmady@fkip.unmul.ac.id[2], desyrusmawaty@fkip.unmul.ac.id[3]
Correspondence author Email: annisa32.02@gmail.com

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Abstract
Despite the widespread shift to digital learning during the pandemic, limited research has examined how contextual factors influence ICT adoption patterns among EFL teachers in developing regions. This study investigates Information and Communication Technology (ICT) adoption among 247 English as a Foreign Language (EFL) teachers in Kutai Kartanegara, Indonesia, using an extended Technology Acceptance Model (TAM) framework. The research addresses the critical gap in understanding technology integration patterns in post-pandemic Indonesian EFL education contexts.Using Structural Equation Modeling, the study examined core TAM constructs (perceived usefulness, perceived ease of use, attitude toward using, behavioral intention, and actual system use) alongside five extended constructs: digital self-efficacy, facilitating conditions, social influence, technology anxiety, and pandemic technology familiarity. Results revealed moderate-to-high ICT adoption levels, with video conferencing tools achieving the highest adoption rates, particularly Zoom, Google Meet, and WhatsApp for educational purposes. In contrast, AI-powered tools showed the lowest adoption rates, with limited integration in lesson planning activities. The extended TAM demonstrated superior explanatory power, accounting for 63% of variance compared to traditional models. All hypothesized relationships were supported, with perceived usefulness emerging as the strongest predictor of positive attitudes and digital self-efficacy significantly influencing perceived ease of use.Notable findings include persistent digital divides between beginner and advanced users, and the significant influence of pandemic technology familiarity on current adoption patterns, validating emergency remote teaching's lasting impact on educational practices. The study provides practical implications for differentiated professional development, infrastructure investment prioritizing reliable connectivity, and targeted interventions addressing confidence-building alongside technical training to enhance educational technology integration in developing regions.

Keywords: Technology Acceptance Model (TAM); ICT adoption; EFL teachers; English as a Foreign Language; pandemic technology familiarity

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1. Introduction

The integration of Information and Communication Technology (ICT) in English as a Foreign Language (EFL) instruction has become increasingly critical in the post-pandemic educational landscape. Recent developments in artificial intelligence, virtual reality, and mobile learning technologies have revolutionized language teaching methodologies, creating unprecedented opportunities for immersive and personalized learning experiences. The COVID-19 pandemic catalyzed digital transformation in education, forcing educators worldwide to adopt ICT tools for remote learning rapidly.

This sudden shift revealed both the potential and challenges of technology integration in EFL contexts. While some teachers successfully leveraged digital platforms to maintain learning continuity, others struggled with technical barriers and pedagogical adaptation. The emergency remote teaching period created what researcher term "forced adoption" scenarios, potentially altering traditional technology acceptance patterns through crisis-driven familiarity and necessitating updated theoretical frameworks to understand contemporary adoption behaviors.

Recent research emphasizes the growing importance of understanding teachers' technology acceptance in the evolving educational landscape. Studies across multiple countries reveal that EFL teachers' technology adoption patterns have significantly evolved since 2020, with mobile learning applications and AI-powered tools becoming increasingly prevalent. However, adoption rates remain inconsistent, suggesting that factors beyond infrastructure influence teachers' technology acceptance decisions.

In the Indonesian context, regional infrastructure disparities significantly influence adoption rates. Teachers in resource-rich areas like East Kalimantan show higher adoption rates compared to remote regions, primarily due to better internet connectivity and institutional support. The MGMP Bahasa Inggris in Kutai Kartanegara represents a unique professional learning community that has undergone significant transformation in recent years, actively

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promoting digital literacy initiatives and organizing training programs focused on ICT integration.

The Kutai Kartanegara region presents a compelling case study for understanding ICT adoption in transitional educational contexts. As part of Indonesia's resource-rich East Kalimantan province, the area benefits from economic development and infrastructure investment, yet faces persistent challenges including inconsistent internet connectivity in outer districts, limited technical support availability, and varying levels of institutional commitment to technology integration. The MGMP Bahasa Inggris (English Teacher Professional Community) in Kutai Kartanegara represents a unique professional learning network of 247 EFL teachers across 89 schools, encompassing both well-equipped urban institutions and resource-constrained suburban schools.

Recent regional data indicate that while 78% of schools have internet access, connection reliability varies significantly, with teachers reporting frequent disruptions affecting their willingness to integrate technology-dependent activities. Additionally, the mixed socioeconomic backgrounds of students create pressure for teachers to adopt accessible, low-bandwidth solutions rather than sophisticated digital tools, influencing their technology selection and usage patterns.

Despite technological infrastructure developments, including 5G network expansion and government-sponsored school digitization programs, adoption rates continue to vary. This suggests that factors beyond infrastructure influence teachers' technology acceptance decisions, necessitating investigation through updated theoretical frameworks that consider post-pandemic realities and emerging technologies.

While extensive research has examined technology acceptance in educational contexts globally, there remains a significant gap in understanding how extended TAM constructs specifically influence ICT adoption among EFL teachers in Indonesian semi-urban contexts like Kutai Kartanegara. Most existing studies focus on either purely urban or rural settings, with limited attention to rapidly developing regions with mixed infrastructure capabilities.

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This study addresses this research gap by investigating current levels of ICT adoption among EFL teachers in MGMP Bahasa Inggris Kutai Kartanegara and examining how both core TAM constructs and extended factors influence their technology acceptance decisions in the contemporary educational landscape.

2. Method

This study employed a quantitative correlational-explanatory design using Structural Equation Modeling to investigate ICT adoption among EFL teachers. The correlational-explanatory approach enabled examination of relationships between variables while testing theoretical models, specifically aligning with the study's objectives to understand both the strength of relationships and the explanatory power of the extended TAM framework.

The target population consisted of EFL teachers who were active members of MGMP Bahasa Inggris in Kutai Kartanegara. A stratified random sampling technique was employed to ensure representation across different school types, teaching levels, and experience levels. The final sample comprised 247 participants obtained through multiple recruitment channels, including collaboration with MGMP coordinators and distribution via WhatsApp groups and official email lists.

The primary research instrument was a structured questionnaire based on validated TAM scales, adapted for EFL contexts and contemporary ICT tools. The questionnaire consisted of seven sections using 7-point Likert scales, covering perceived usefulness, perceived ease of use, attitude toward using, behavioral intention, digital self-efficacy, facilitating conditions, social influence, technology anxiety, pandemic technology familiarity, and actual system use.

Instrument validation included content validity assessment through expert review by three specialists, achieving a Content Validity Index of 0.85. Construct validity was assessed through Confirmatory Factor Analysis, with factor loadings exceeding 0.70. Reliability assessment showed Cronbach's alpha coefficients ranging from 0.841 to 0.891 across all constructs.

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Data collection occurred over six weeks through online surveys administered via Google Forms. Analysis followed a systematic five-phase approach using SPSS, including preliminary analyses, Exploratory Factor Analysis, Confirmatory Factor Analysis, Structural Equation Modeling, and additional analyses including moderation and mediation testing.

3. Findings and Discussion

3.1 Current ICT Adoption Levels: A Digital Transformation Narrative

The investigation into ICT adoption among EFL teachers in Kutai Kartanegara unveils a compelling narrative of educational transformation shaped by necessity, pragmatism, and persistent inequalities. The data reveals what researchers characterize as "strategic moderate-to-high ICT adoption levels" across the region, with usage indices ranging from 2.76 to 4.12 on a six-point scale, painting a picture of educators who have become discriminating consumers of educational technology.

At the apex of this technological hierarchy stands video conferencing tools, achieving the highest adoption rate with a usage index of 4.12. This dominance tells a story that extends far beyond mere numerical preference. As documented in the research, "the pandemic served as an unexpected catalyst, accelerating changes that might have taken years to implement under normal circumstances." The platform preferences reveal interesting patterns: Zoom commands the largest user base at 89.5% of respondents, followed by Google Meet at 73.2%, while WhatsApp for educational purposes achieves an impressive 94.3% adoption rate, demonstrating how ubiquitous consumer technologies were repurposed for educational needs.

The research reveals that this prominence "reflects more than mere technological preference; it represents the lasting legacy of emergency remote teaching that transformed educational practices during the COVID-19 pandemic." Teachers who previously relied on traditional methods suddenly found themselves navigating digital environments, creating what the study terms "forced adoption scenarios." This involuntary immersion appears to have generated lasting familiarity and comfort with certain technologies, particularly those that proved essential for maintaining educational continuity during lockdowns.

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Mobile learning applications occupy the second tier of adoption with a usage index of 3.89, revealing educators' appreciation for accessibility and flexibility. Duolingo for Schools attracted 67.6% of users, while Quizizz achieved remarkable penetration at 78.9% adoption. The research notes that "teachers integrated Duolingo's gamified approach to supplement classroom instruction," with many appreciating "the progress tracking features [that] allowed teachers to monitor student engagement with independent study." WhatsApp's educational transformation particularly stands out, with the study observing that "teachers created class groups for sharing announcements, homework assignments, and supplementary materials," while "the voice message feature became particularly valuable for pronunciation practice."

Learning Management Systems demonstrate moderate but significant adoption at a usage index of 3.67, with Google Classroom leading at 82.6% user adoption. The research documents how "Google Classroom became the backbone of many teachers' digital instruction strategies," with its "intuitive interface and integration with other Google tools [making] it accessible even to teachers with limited technical skills." Moodle, while used by only 23.5% of respondents, attracted teachers in schools with dedicated IT support who utilized its "quiz builder for comprehensive assessments" and "forum feature for extended discussions."

Digital assessment tools achieved a usage index of 3.45, dominated by Google Forms at 91.1% adoption and Kahoot! at 85.4%. The research reveals that "Google Forms dominated digital assessment due to its simplicity and versatility," with teachers creating "everything from simple vocabulary quizzes to complex reading comprehension tests with multimedia elements." The automatic grading feature proved particularly valuable, as "the automatic grading feature for multiple-choice questions saved significant time, while the response summary provided immediate insight into class performance."

However, the most striking finding emerges from the technology adoption hierarchy's lower tier. AI-powered tools languish at the bottom with a usage index of only 2.76, where a concerning 52.6% of educators report never or rarely engaging with these technologies. Only 31.2% of teachers use ChatGPT for lesson planning, revealing what the research characterizes

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as "appropriate caution toward emerging technologies lacking established pedagogical frameworks."

This selective adoption pattern illuminates a fundamental truth about educational technology integration. As the research argues, "this pattern suggests that while the pandemic accelerated adoption of communication and basic instructional technologies, it did not eliminate the natural caution educators exhibit toward more sophisticated or unfamiliar innovations." Teachers demonstrate sophisticated filtering mechanisms, "readily adopting tools with demonstrated classroom value while maintaining appropriate caution toward emerging technologies lacking established pedagogical frameworks."

The digital divide narrative emerges as perhaps the most concerning aspect of the findings. The research reveals "persistent digital divides within the teaching community," where "the contrast between high-adopting and low-adopting teachers isn't primarily about age, experience, or even training—it's about confidence, support, and accumulated positive experiences with technology." The statistics are stark: 65.2% of beginner users are classified as low adopters compared to only 7.9% of advanced users, creating what the study terms "a concerning feedback loop where those who most need support to bridge technological gaps are least likely to receive the benefits of advanced educational technologies."

Geographic disparities compound these challenges significantly. The research documents how "urban schools demonstrate significantly higher adoption rates than their rural counterparts," reflecting "broader infrastructure inequalities that extend beyond individual teacher preferences to encompass systemic issues of connectivity, technical support, and resource availability." This urban-rural divide represents more than simple access issues; it reflects fundamental structural inequalities in Indonesian education infrastructure.

The research concludes that "these findings collectively point toward several critical insights for educational technology implementation strategies," emphasizing that successful implementations must clearly demonstrate pedagogical benefits while addressing the complex

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interplay of individual confidence, institutional support, and technological accessibility that shapes adoption decisions in contemporary educational environments.

3.2 Extended TAM Model Validation: Revealing the Hidden Mechanisms of Technology Acceptance

The extended Technology Acceptance Model framework demonstrated remarkable theoretical sophistication and empirical power, achieving superior explanatory power by accounting for 63.4% of variance compared to traditional models' typical 40-45%. This substantial improvement represents more than statistical enhancement; it reveals previously hidden mechanisms underlying technology adoption decisions in educational contexts, aligning with (Davis, 1989) original proposition that technology acceptance models require contextual adaptation for maximum explanatory power.

The comprehensive hypothesis testing yielded compelling results, with all ten hypothesized relationships receiving support at $p < 0.001$ significance levels. This provides strong empirical support for the extended TAM model within the Indonesian higher education context (Venkatesh et al., 2003), validating both core TAM principles and the theoretical importance of contextual extensions.

The validation of core TAM relationships confirms enduring human truths about how people decide to embrace new ways of working. This study finds that TAM maintains validity across diverse cultural and technological contexts. Perceived usefulness emerged as the strongest attitude predictor with a path coefficient of $\beta = 0.423$, reinforcing the fundamentally pragmatic nature of educator decision-making documented in previous educational technology research (Teo, 2011).

Teachers consistently prioritize tools and systems that demonstrably enhance their instructional effectiveness, improve student engagement, or streamline administrative tasks. This utilitarian approach reflects the professional responsibility educators feel toward student outcomes (Ertmer, 2005), suggesting that successful technology implementations must clearly articulate and demonstrate pedagogical benefits. When teachers report high perceived

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usefulness, they're expressing professional judgment earned through years of classroom experience—they've learned to distinguish between technologies that offer genuine pedagogical benefits and those that merely add complexity without clear advantages (Liu et al., 2017).

The perceived ease of use to attitude relationship (β = 0.289), while significant, proved weaker than usefulness effects, challenging common assumptions in user interface design literature. While ease of use matters, educators appear willing to invest time and effort in learning complex systems if the perceived benefits justify the investment (Scherer et al., 2019). This suggests that successful technology implementations must clearly demonstrate and communicate pedagogical benefits rather than focusing primarily on interface simplicity.

The robust relationship between perceived ease of use and perceived usefulness (β = 0.542) reveals a critical mechanism underlying technology acceptance, supporting Davis's (1989) theoretical proposition that usability directly influences utility perceptions. Systems that are easier to use are perceived as more useful, creating a positive reinforcement cycle that can accelerate adoption. Initial user experiences with educational technologies are crucial, as early difficulties with system usability can undermine perceptions of overall value and utility.

The attitude to behavioral intention relationship (β = 0.567) demonstrates the cognitive-affective foundation of technology adoption decisions in educational settings, consistent with the Theory of Planned Behavior's emphasis on attitudinal influences on behavioral intentions (Steel & Hudson, 2001). Teachers who develop positive attitudes toward technologies show high likelihood of forming usage intentions, supporting the importance of addressing not just rational concerns but also emotional responses to technological innovations.

Perhaps most remarkably, the behavioral intention to actual use relationship achieved β = 0.689, indicating remarkably high intention-behavior consistency in educational technology contexts. This finding suggests that when teachers form genuine intentions to use educational technologies, they typically follow through with actual implementation (Teo et al., 2018). The consistency may reflect the structured nature of educational environments, where

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technology use decisions often involve formal planning and integration into instructional routines.

The extended constructs proved their theoretical value by contributing significantly beyond core TAM components, supporting (Venkatesh et al., 2003)argument for context-specific model extensions. Digital Self-Efficacy emerged as perhaps the most critical addition, with a path coefficient of $\beta = 0.456$ from digital self-efficacy to perceived ease of use. This relationship self-efficacy theory in technological contexts, revealing that teachers' confidence in their technological abilities significantly influences their perceptions of system usability.

This finding illuminates confidence cycles in technology adoption, where teachers with higher digital self-efficacy find technologies easier to use, which enhances their perceptions of usefulness, leading to more positive attitudes and stronger adoption intentions (Mei et al., 2018). Conversely, teachers with lower self-efficacy may struggle with initial technology use, leading to perceptions of difficulty that undermine value assessments and create negative adoption cycles.

The central importance of digital self-efficacy suggests that professional development efforts should prioritize confidence-building alongside skill development (Zheng et al., 2024). This insight redirects focus from what teachers should learn to how they can develop the resilience and confidence to keep learning as technologies continue to evolve.

Facilitating Conditions demonstrated a significant relationship with perceived usefulness ($\beta = 0.278$), highlighting the crucial role of institutional context in shaping individual adoption decisions, consistent with UTAUT's emphasis on environmental factors (Venkatesh et al., 2003). Organizational support—including technical infrastructure, training resources, and administrative backing—directly influences how teachers perceive the usefulness of educational technologies.

Schools that provide comprehensive support systems enable teachers to realize greater value from technology investments, while inadequate support can undermine even well-designed systems (Mirzajani et al., 2016a). This finding emphasizes that technology adoption

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requires comprehensive institutional support and that successful technology integration begins not with the latest tools or the most sophisticated training programs, but with building teachers' confidence in their ability to master new technologies.

Social Influence showed a moderate but significant effect on attitude toward using (β = 0.234), revealing the inherently social nature of educational technology adoption within professional communities, supporting research on social factors in technology acceptance (Brown, 2016). Teachers make adoption decisions within contexts where peer opinions, administrative expectations, and cultural norms significantly influence individual choices (Ventista & Brown, 2023). Successful technology implementations must consider not just individual teacher needs but also the broader social context within which adoption decisions occur.

Technology Anxiety demonstrated a negative relationship with attitude toward using (β = -0.189), confirming that emotional barriers can significantly impede technology adoption, even when rational benefits are clear (Mohan, 2013). While this effect was smaller than anticipated, it may reflect successful anxiety-reduction efforts during pandemic-driven technology adoption or suggest that institutional support can effectively mitigate technology-related fears.

The novel construct of Pandemic Technology Familiarity showed a significant relationship with perceived ease of use (β = 0.312), providing empirical support for the forced adoption hypothesis proposed by (Han & Guo, 2025). Pandemic-induced technology experiences continue to influence current adoption patterns, with teachers who gained familiarity during emergency remote teaching maintaining enhanced perceptions of technology usability.

This evidence suggests that crisis-driven technology exposure can create lasting positive effects on adoption readiness (Anwar et al., 2020), indicating that appropriately supported intensive experiences—even difficult ones—can produce lasting benefits for

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technology acceptance. This finding validates the inclusion of pandemic-related factors in contemporary technology acceptance research.

The Human Dimension: Understanding Teacher Experiences Through TAM Constructs

The moderate-to-high perceived ease of use scores (Mean: 3.42/7.0) represent working confidence, where most teachers have achieved functional technological competence—they can navigate basic ICT functions and feel reasonably comfortable with familiar tools, but they recognize that they still need support when venturing into more advanced features or newer technologies. This reflects a realistic self-assessment that points toward specific professional development needs: these teachers aren't asking for basic computer literacy training, but rather for guidance in applying their existing skills to new educational contexts (Rogers, 2000).

The high perceived usefulness scores (Mean: 4.18/7.0) reveal something fundamental about the teaching profession, as these educators have developed sophisticated mental frameworks for evaluating whether new tools truly serve their students' learning needs (Ertmer, 2005). When teachers report high perceived usefulness, they're expressing professional judgment earned through years of classroom experience.

Teachers in Kutai Kartanegara have moved beyond viewing technology as an external imposition to seeing it as a potential ally in their educational mission. However, this also places a responsibility on technology providers and professional development programs to clearly demonstrate and support the pedagogical applications of new tools (Bui, 2022).

The strong relationship between behavioral intention (Mean: 4.02/7.0) and actual system use (Mean: 3.24/7.0) tells an encouraging story: these aren't reluctant adopters being pushed by administrative mandates; these are professionals who have recognized technology's potential and formed genuine commitments to expanding their digital integration.

However, the gap between intention and actual use reveals persistent implementation challenges. The gap between intention and actual use—while not dramatic—reveals the persistent challenges that even motivated teachers face in translating their technological aspirations into classroom reality, pointing to implementation barriers: perhaps inadequate time

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for learning new systems, insufficient technical support when problems arise, or curriculum pressures that make it difficult to experiment with new approaches (Cunningham, 2021).

Validating the Extended Framework: A Comprehensive Approach

The extended constructs in the model reveal the complex ecosystem within which individual teachers make technology decisions, supporting theoretical arguments for contextualized technology acceptance models (Taherdoost, 2016). Digital self-efficacy emerges not just as a statistical construct but as a deeply personal dimension of professional identity, where teachers with high digital self-efficacy have developed technological resilience—the confidence that they can figure out new systems, troubleshoot problems, and adapt to changing technological landscapes.

This isn't just about current skill levels; it's about self-perception and professional confidence that influences every subsequent technology encounter (Tamilmani et al., 2021). This finding suggests that building self-efficacy may be more important than specific technical training, as it creates the foundation for continued learning and adaptation.

Facilitating conditions represent the often-invisible infrastructure of support that can make or break technology integration efforts, consistent with research on organizational factors in technology adoption (Han & Guo, 2025). When teachers report strong facilitating conditions, they're describing an environment where they feel supported in taking technological risks, where help is available when needed, and where institutional priorities align with their professional development needs.

The role of institutional support and professional development cannot be understated (Ardıç & Çiftçi, 2019), as teachers' perceptions are influenced by their experiences and the support they receive from educational institutions (Watson, 2014). This finding underscores that technology adoption is not merely an individual decision but occurs within organizational contexts that can either enable or constrain adoption efforts.

The social influence dimension captures something essential about teaching as a fundamentally collaborative profession (Davis, 1989). Teachers don't make adoption decisions

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in isolation; they're influenced by conversations in faculty lounges, observations of colleagues' successes and struggles, and the subtle but powerful pressures of professional community expectations.

This finding has particular relevance to the MGMP context, where professional learning communities in technology adoption show that teachers in supportive collaborative environments were more likely to adopt innovative technologies and sustain usage over time (Zhang, 2022). Social influence operates through multiple channels, including peer modeling, collaborative problem-solving, and shared professional development experiences.

3.3 Mediation and Moderation Effects: Unraveling Complex Pathways to Technology Adoption

The bootstrap mediation analysis with 5,000 resamples revealed intricate pathways through which extended constructs influence technology acceptance outcomes, following established procedures for mediation analysis in SEM (Cheung & Lau, 2008). All mediation relationships represent partial mediation, as both direct and indirect effects remained statistically significant when tested simultaneously, consistent with (Baron & Kenny, 1986) criteria for mediation assessment.

The complete chain effects provide theoretically significant insights into how extended constructs ultimately influence actual system use through the established TAM sequence, supporting theoretical arguments for complex causal pathways in technology acceptance (Markley & Davis, 2007). Digital Self-Efficacy demonstrated the strongest complete chain effect ($\beta = 0.078$, 95% CI [0.045, 0.119]), revealing a sophisticated process where confidence in digital capabilities indirectly influences actual usage through enhanced ease of use perceptions, increased usefulness beliefs, positive attitudes, stronger intentions, and ultimately greater system use.

This finding supports the theoretical proposition that individual difference factors operate through cognitive-evaluative processes rather than directly determining behaviors (Bandura, 1997), emphasizing that successful technology integration begins not with the latest

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tools or the most sophisticated training programs, but with building teachers' confidence in their ability to master new technologies.

Pandemic Technology Familiarity showed a smaller but meaningful complete chain effect (β = 0.053, 95% CI [0.029, 0.084]), suggesting that pandemic-related technology experiences create cascading influences on actual usage through the TAM pathway (Liu et al., 2017). While smaller than digital self-efficacy effects, this represents a meaningful contribution to understanding how contextual experiences shape technology adoption, validating the inclusion of pandemic-related factors in contemporary technology acceptance research (Anwar et al., 2020).

Sequential Mediation Within Core TAM: Confirming Theoretical Foundations

The analysis confirmed theoretical TAM sequences through significant sequential mediation effects, supporting Davis's (1989) original theoretical propositions. The PEOU → PU → ATU mediation (β = 0.229, 95% CI [0.156, 0.312]) demonstrates that ease of use influences attitudes both directly and indirectly through enhanced perceptions of usefulness, supporting theoretical propositions that usability concerns translate into utility beliefs, which then shape overall evaluative responses.

The PU → ATU → BI mediation (β = 0.240, 95% CI [0.167, 0.324]) confirms that usefulness perceptions influence behavioral intentions both directly and through attitudinal mechanisms (Ajzen, 1991). The ATU → BI → ASU mediation produced the largest effect (β = 0.391, 95% CI [0.298, 0.489]), indicating that attitudes strongly influence actual use through their impact on behavioral intentions, supporting the theory of planned behavior foundations underlying TAM.

The extended constructs demonstrate meaningful indirect effects through core TAM pathways, validating the theoretical integration of individual and contextual factors with established acceptance predictors (Venkatesh et al., 2003). Digital Self-Efficacy shows the strongest mediation effects, with its influence on Perceived Usefulness mediated through Perceived Ease of Use (β = 0.247, 95% CI [0.178, 0.325]).

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This finding supports the theoretical argument that self-efficacy beliefs primarily influence technology acceptance through usability perceptions rather than direct utility assessments (Li et al., 2024). Confidence in technological abilities first affects how easy systems seem to use, which then influences perceptions of their practical value.

Facilitating Conditions demonstrates a smaller but significant mediation effect through the PU → ATU pathway (β = 0.118, 95% CI [0.071, 0.171]), suggesting that institutional support enhances attitudes by increasing perceptions of system utility. This mediation pattern aligns with UTAUT theory, which positions facilitating conditions as enabling factors that enhance the value proposition of technology use (Venkatesh et al., 2003).

The moderation analysis revealed that digital literacy significantly influences relationship strength within the extended TAM model, providing important insights into how individual capabilities shape technology acceptance processes (Tondeur et al., 2017). Digital literacy emerged as a significant moderator for four critical pathways, with interaction effects ranging from small to moderate magnitude.

The most substantial moderation occurred in the perceived usefulness to attitude relationship (β = 0.187, $p < 0.001$), where digital literacy amplified the influence of utility perceptions on technology attitudes. Students with higher digital literacy are more capable of translating usefulness assessments into positive attitudes, possibly because they better understand how to leverage technology features for academic benefit (Scherer et al., 2019).

Simple slopes analysis revealed striking patterns across digital literacy levels. For the PU → ATU relationship, the effect nearly doubled from beginner (β = 0.267) to advanced users (β = 0.598), demonstrating that digital literacy significantly enhances ability to form positive attitudes based on usefulness perceptions. Even more dramatically, the PEOU → ATU relationship was non-significant for beginners (β = 0.178, $p = 0.067$) but became strongly significant for advanced users (β = 0.421, $p < 0.001$).

This pattern suggests that digital literacy serves as an enabling condition that allows effective processing and response to usability experiences (Granić & Marangunić, 2019). The

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moderation of the intention-behavior relationship proves particularly noteworthy, as it indicates that digital literacy facilitates the translation of intentions into actual usage behaviors, with higher literacy users better equipped to overcome implementation barriers and convert positive intentions into sustained technology use.

School Type Moderation: Institutional Context Effects

The institutional context analysis revealed that school type significantly moderates facilitating conditions effects, uncovering important organizational influences on technology acceptance processes (Mohamad Nafis & Mohamad Nasri, 2024). The analysis showed that facilitating conditions exert significantly stronger effects in private schools compared to public institutions, with the FC → PU relationship being 52% stronger in private schools ($\beta = 0.356$ vs. $\beta = 0.234$) and the FC → ATU relationship being 84% stronger ($\beta = 0.267$ vs. $\beta = 0.145$).

These differences likely reflect the superior technological infrastructure, technical support, and resource availability typically found in private educational institutions ((Mirzajani et al., 2016b). This moderation pattern indicates that institutional support has a more pronounced impact on perceptions when the support is comprehensive and readily accessible, as is more common in well-resourced private schools.

Students in private institutions may be more sensitive to facilitating conditions because they have higher expectations for institutional support and are more accustomed to receiving adequate technological assistance. Conversely, students in public schools may have developed greater self-reliance and lower expectations for institutional support, reducing the impact of facilitating conditions on their technology acceptance (Ghavifekr & Rosdy, 2015).

Interestingly, social influence showed no significant difference between school types ($z = 1.234$, $p = 0.217$), suggesting that peer influence operates similarly across institutional contexts, indicating that social factors in technology acceptance are more universal and less dependent on organizational characteristics than resource-related factors (Ventista & Brown, 2023b).

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4. Conclusion

This comprehensive investigation reveals a complex landscape of educational technology integration extending beyond simple tool availability. EFL teachers in Kutai Kartanegara demonstrate strategic technology consumption, showing moderate-to-high adoption levels while exhibiting clear preferences based on practical utility and accessibility.

The extended TAM framework proved superior to traditional models, accounting for 63.4% of variance through the inclusion of contextually relevant constructs. Digital self-efficacy emerged as the most critical factor, creating confidence cycles that accelerate adoption. Pandemic technology familiarity validated the lasting impact of crisis-driven technology exposure, while facilitating conditions and social influence emphasized the importance of institutional and community support.

Persistent digital divides remain concerning, with significant disparities between beginner and advanced users compounded by urban-rural infrastructure differences. The findings suggest that successful technology integration requires comprehensive approaches addressing individual confidence-building, institutional support systems, and targeted interventions for struggling adopters.

The validation of core TAM relationships confirms enduring human truths about technology adoption, while extended constructs reveal the complex interplay of individual capabilities, institutional support, and professional community dynamics. These insights provide valuable guidance for educational stakeholders seeking to enhance technology integration in similar developing educational contexts.

Future research should pursue longitudinal studies tracking adoption patterns over time, mixed-methods approaches incorporating qualitative insights, and technology-specific models addressing rapidly evolving educational technologies. Cross-cultural validation in diverse Indonesian contexts would enhance generalizability, while implementation effectiveness studies linking adoption to student outcomes would provide crucial evidence of academic impact.

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