

Physics Teachers' Perspectives on the Use of Learning Management Systems: A Technology Acceptance Model Study in Benguet and Baguio City

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ABSTRACT

This study examined university physics instructors' perspectives on LMS use in Benguet and Baguio City through the Technology Acceptance Model (TAM). A quantitative descriptive-correlational design was used with 37 physics instructors from eight higher education institutions selected through convenience sampling. The remaining tested relationships were not statistically significant. The findings position perceived usefulness and behavioral intention as the most consequential correlates of LMS use in this sample. Institutions should therefore pair technical training with discipline-specific demonstrations of LMS value, peer support, and sustained implementation guidance.

INTRODUCTION

Learning management systems provide a digital environment for organizing course materials, distributing resources, communicating with learners, administering assessments, and documenting participation. Their availability, however, does not guarantee meaningful instructional integration. Research on educational technology consistently shows that users' beliefs about usefulness, usability, and intended future use shape whether a system becomes embedded in practice or remains a minimally used administrative tool (Granić & Marangunić, 2019; Scherer et al., 2019). In higher education, this distinction matters because an LMS can be technically available while instructors still rely on only a small subset of its features.

The Technology Acceptance Model (TAM) offers a parsimonious explanation for this problem. Davis (1989) proposed perceived usefulness and perceived ease of use as central beliefs that influence users' acceptance of technology. Subsequent work in educational contexts has supported the general explanatory value of TAM while also showing that the strength of individual paths varies across technologies, samples, and settings (Scherer & Teo, 2019; Scherer et al., 2019). Systematic reviews focused specifically on LMS adoption likewise identify TAM as one of the dominant frameworks for explaining acceptance in higher education (Al-Nuaimi & Al-Emran, 2021; Cavus et al., 2022).

The issue is especially relevant to physics education. Physics instruction often involves abstract concepts, representations, problem solving, laboratory-related activities, multimedia explanations, and repeated engagement with instructional materials. An LMS can support these processes through resource repositories, asynchronous discussion, assessment tools, progress monitoring, and multimedia delivery. A physics-specific preliminary study reported that science and physics teachers valued LMS development for greater flexibility and efficiency and expressed interest in features such as file submission, quizzes, discussion functions, video conferencing, and automated grade management (Nazhifah & Fathurohman, 2023). Yet the educational benefits of these features still depend on teachers' willingness and capacity to use them.

Evidence from higher education also suggests that faculty acceptance is shaped by more than technical access. In a Philippine higher education sample, system quality and self-efficacy were important in explaining perceived usefulness and ease of use among faculty members (Fearnley & Amora, 2020). Studies in other developing-country contexts similarly show that usability, facilitating conditions, support, and perceived value can influence instructors' intentions to adopt LMSs (Waris & Hameed, 2023). These findings indicate that institutional implementation should consider both technology characteristics and the beliefs of the instructors who are expected to integrate the system into teaching.

Despite the breadth of LMS research, two gaps remain relevant to the present study. First, much of the TAM-LMS literature has focused on students, general faculty populations, or broad educational technologies rather than university physics instructors as a disciplinary group. Second, studies frequently examine acceptance constructs without concurrently documenting the

implementation challenges that may shape how teachers interpret those constructs. The present study addresses these gaps by examining five TAM-related constructs together with perceived LMS challenges among university physics instructors across several higher education institutions in Benguet and Baguio City. The study does not claim to be the first investigation of LMS acceptance in physics education; rather, its contribution is to provide localized, discipline-specific evidence and to test a set of relationships among usefulness, ease of use, attitude, behavioral intention, and actual use within this context.

Accordingly, the study pursued three objectives: (1) determine the level of agreement among university physics instructors regarding perceived usefulness, perceived ease of use, attitude toward using LMS, behavioral intention, and actual use; (2) determine the level of challenges experienced in LMS use; and (3) examine the relationships among selected TAM constructs. These objectives were operationalized through descriptive statistics, one-sample tests against the midpoint of the study's moderate interpretation range, and Pearson correlation analysis.

THEORETICAL REVIEW

Technology Acceptance Model in Education

TAM explains technology acceptance through beliefs and behavioral responses. Perceived usefulness refers to the extent to which a person believes a technology will improve performance, whereas perceived ease of use refers to the degree to which use is expected to require limited effort (Davis, 1989). In educational applications, these beliefs are commonly connected to attitude, behavioral intention, and actual use. A systematic review of TAM in educational settings concluded that perceived usefulness and perceived ease of use are persistent antecedents of technology acceptance, although studies vary in the additional factors and pathways they include (Granić & Marangunić, 2019).

Teacher-focused meta-analytic evidence provides an important qualification. Scherer et al. (2019), synthesizing teacher samples across many digital technologies, found that TAM explains technology adoption reasonably well but that relationships among constructs are not uniform across contexts. Scherer and Teo (2019) likewise showed that TAM variables explain a substantial share of teachers' intentions to integrate technology, while study characteristics moderate the magnitude of the paths. These findings justify using TAM as an organizing framework while cautioning against assuming that every canonical relationship must be significant in every population.

The broader e-learning literature also points to factors outside the core TAM. Abdullah and Ward (2016) identified self-efficacy, subjective norm, enjoyment, computer anxiety, and experience as recurring external variables in e-learning acceptance models. Al-Nuaimi and Al-Emran (2021) similarly classified LMS-related external factors into individual, contextual, and psychological or behavioral categories. Thus, a weak or nonsignificant association among two TAM variables does not necessarily imply that LMS acceptance is random; it may indicate that other system, user, or organizational influences are operating in the specific setting.

LMS Acceptance in Higher Education and Physics Instruction

LMS acceptance research has repeatedly found perceived usefulness to be consequential. Al-Fraihat et al. (2020) reported that perceived usefulness was among the determinants of e-learning use and perceived benefits within a broader e-learning success model. In a Philippine faculty study, Fearnley and Amora (2020) found that system quality and perceived self-efficacy shaped perceived usefulness, which in turn influenced acceptance-related outcomes. Waris and Hameed (2023) also reported that an extended TAM predicted university faculty members' intention to use an LMS in a developing-country context. Together, these studies suggest that instructors are more likely to sustain LMS use when they can connect the platform to concrete teaching benefits rather than simply perceive it as available or technically functional.

Behavioral intention is another recurring bridge between beliefs and use. Research using LMS and related platforms has reported positive links between intention and actual use, although the composition of the models varies (Al-Maroofof & Al-Emran, 2018; Yakubu et al., 2020). A comparison of faculty and student LMS acceptance further showed that user groups can differ in the factors that trigger acceptance behavior, underscoring the value of examining instructors separately rather than extrapolating from student data (Kim et al., 2021).

The present instrument was reconstructed partly from Quansah and Essiam (2021), who used TAM to examine LMS Moodle acceptance among university students. Their study operationalized perceived usefulness, perceived ease of use, behavioral intention, and actual use. In the current teacher-focused study, the instrument also included attitude and a separate set of challenge items. The adaptation is relevant because physics instructors interact with LMSs as course designers, content managers, assessors, and facilitators, roles that differ from student use. Physics-specific work by Nazhifah and Fathurohman (2023) further supports examining teacher expectations for user-friendly, flexible, and instructionally functional LMS environments.

Research Model and Hypotheses

The analytical framework retained the five constructs used in the thesis are the following: perceived usefulness (U), perceived ease of use (E), attitude toward LMS use (A), behavioral intention (BI), and actual use (AU) while treating LMS challenges as a separate descriptive construct. Figure 1 shows the relationships examined. Solid arrows represent core TAM pathways that were tested, whereas dashed arrows indicate additional direct relationships tested in the original study.

Solid arrows: core TAM paths tested; dashed arrows: additional direct relationships tested

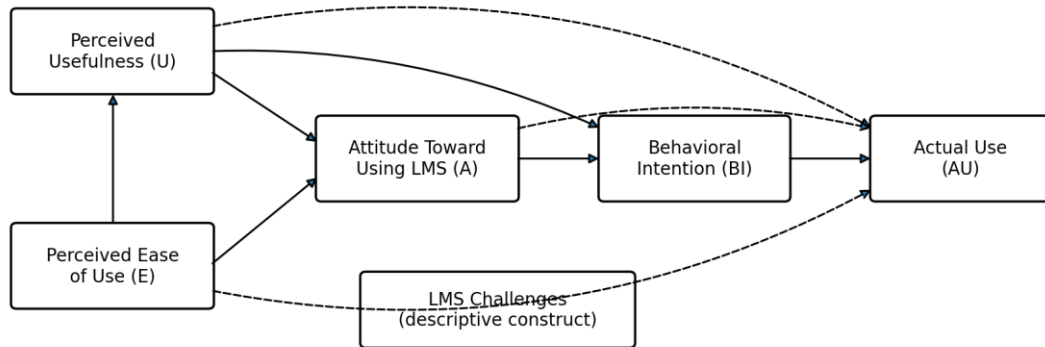


Figure 1. Analytical framework and tested relationships. Adapted from Davis (1989) and operationalized for the present study.

For hypothesis testing, the descriptive hypotheses were stated as follows: H01, each composite agreement score does not differ significantly from the moderate benchmark of 2.12; H02, the composite challenge score does not differ significantly from 2.12. For the correlational objective, H03a–H03i stated that no significant relationships exist for the nine tested pairs: U–E, U–A, E–A, A–AU, U–AU, E–AU, U–BI, BI–AU, and A–BI. A two-tailed alpha level of .05 was used.

METHODOLOGY

Research Design, Locale, and Participants

The study used a quantitative descriptive-correlational design. The descriptive component assessed instructors' agreement with statements representing the TAM constructs and their perceived LMS challenges. The correlational component examined bivariate relationships among the five acceptance constructs. Data were collected through an electronic survey distributed using an online form.

Participants were 37 instructors who had handled physics or a related subject during the second semester of School Year 2023–2024. They came from eight higher education institutions located in La Trinidad, Benguet, and Baguio City: Benguet State University–La Trinidad, University of the Cordilleras, University of Baguio, Saint Louis University, Baguio Central University, University of the Philippines Baguio, Cordillera Career Development College, and King's College of the Philippines. Participants were selected through convenience sampling based on accessibility, availability, and willingness to participate. Because the design used a small nonprobability sample, the findings are best interpreted as context-specific evidence rather than population estimates for all physics instructors.

Instrument

The questionnaire consisted of a pre-survey identifying LMS platforms used by respondents and a 29-item rating instrument. The rated items were organized as follows: perceived usefulness, 5 items; perceived ease of use, 5 items; behavioral intention, 2 items; attitude toward use, 4 items; actual use, 6

items; and LMS challenges, 7 items. This item count follows the questionnaire reproduced in the thesis appendix rather than the inconsistent counts stated in the original methodology narrative.

The core TAM portion was reconstructed from Quansah and Essiam (2021) and supplemented by items drawn from the thesis's related literature. Responses used a four-point scale coded 1 = Strongly Agree, 2 = Agree, 3 = Disagree, and 4 = Strongly Disagree. Consequently, lower scores indicate stronger agreement. For the challenge items, agreement corresponded to a greater perceived limitation, so lower scores indicate a higher perceived challenge. The source thesis reports that experts in educational technology and LMS use evaluated the instrument for content validity, yielding a validity coefficient of 0.98. A pilot test with 30 physics or related-subject teachers produced a Cronbach's alpha of 0.92 for internal consistency.

The study's interpretation bands were 1.00–1.74 = high agreement, 1.75–2.49 = moderate agreement, 2.50–3.24 = slight agreement, and 3.25–4.00 = strong disagreement. For challenges, the corresponding labels were highly challenging, moderately challenging, slightly challenging, and the least-challenging end of the scale. Because the instrument reverses the usual direction of a Likert score, interpretation throughout this paper follows the original coding rather than assuming that a larger mean represents stronger acceptance.

Data Collection and Ethical Considerations

The researcher prepared the online questionnaire and requested authorization from the relevant school heads or college deans before distribution. Survey links were then circulated electronically through email and social-media channels. The documentation supplied with the thesis states that participation was voluntary and that information would be treated confidentially. A formal research-ethics committee approval number was not reported in the source manuscript; therefore, none is claimed in this enhanced article.

A data-reconciliation step was necessary because several narrative tables and summary statements in the source thesis conflict with the statistical output reproduced in its appendices. Where such conflicts occurred, this article treated the appendix statistical output as the controlling record. This approach corrected, among other issues, the combine challenge mean and several hypothesis decisions without creating new observations or altering the original dataset.

Data Analysis

Combined means summarized each variable. To test whether a variable differed from the center of the study's moderate category, one-sample *t* tests used 2.12 as the test value, which is the midpoint of 1.75–2.49. A significant negative *t* value therefore indicates a mean lower than 2.12 and, because of the coding scheme, a direction toward stronger agreement or greater challenge. Statistical significance does not automatically change the categorical interpretation band; for example, a mean can remain within the moderate range while being significantly lower than its midpoint.

Pearson product-moment correlations examined the nine specified relationships. The study interpreted absolute *r* values of .00–.19 as very weak,

.20-.39 as weak, .40-.59 as moderate, .60-.79 as strong, and .80-1.00 as very strong. All tests used a two-tailed alpha of .05. The source thesis did not report normality, linearity, or outlier diagnostics; therefore, the correlational findings should be read as exploratory associations, particularly given the small sample size.

RESULTS AND DISCUSSION

Levels of Agreement and LMS Challenges

Table 1 consolidates the construct-level descriptive results and the one-sample tests reproduced in the thesis appendices. All five TAM constructs fell within the study's moderate-agreement band. Perceived usefulness and actual use were both significantly lower than the 2.12 benchmark, indicating stronger agreement than the midpoint of the moderate category, although neither composite crossed the threshold for the study's high-agreement category. Ease of use, behavioral intention, and attitude did not differ significantly from the benchmark. The challenge composite was also within the moderate range and did not significantly differ from the benchmark.

Table 1. Composite construct scores and one-sample tests against the moderate benchmark.

Construct	Mean	Interpretation	t	p	Decision vs. 2.12
Perceived usefulness (U)	1.88	Moderate agreement	-3.17	.003	Significant
Perceived ease of use (E)	2.06	Moderate agreement	-0.63	.535	Not significant
Behavioral intention (BI)	2.05	Moderate agreement	-0.54	.593	Not significant
Attitude toward LMS use (A)	2.18	Moderate agreement	0.76	.455	Not significant
Actual use (AU)	1.88	Moderate agreement	-3.43	.002	Significant
LMS challenges	1.99	Moderately challenging	-1.78	.084	Not significant

Note. n = 37. Lower scores indicate stronger agreement; for challenge items, lower scores indicate greater perceived challenge. Test value = 2.12. Values are reconciled from the appendix statistical output.

Perceived usefulness emerged as one of the clearest positive signals in the data. The composite mean of 1.88 was within the moderate category but significantly lower than the benchmark, $t(36) = -3.17$, $p = .003$. At the item level, instructors reported comparatively strong endorsement of LMS contributions to productivity and effective online teaching. This pattern is consistent with research positioning perceived usefulness as a major determinant of e-learning

acceptance and use (Al-Fraihat et al., 2020; Fearnley & Amora, 2020). For physics instructors, usefulness is likely to be most salient when LMS features reduce routine work, organize instructional resources, or directly support course delivery rather than when the platform is treated as an abstract innovation.

Perceived ease of use was moderate ($M = 2.06$) and statistically indistinguishable from the benchmark. The item profile was uneven: conveying learning materials was rated relatively favorably, while automated grade management and offline usability received less favorable mean scores. This suggests that instructors may distinguish between simple resource-distribution tasks and more advanced or infrastructure-dependent features. Such variation is compatible with the broader LMS literature, in which usability and system quality can affect perceived usefulness but do not uniformly translate into actual adoption behavior (Al-Nuaimi & Al-Emran, 2021; Fearnley & Amora, 2020).

Behavioral intention ($M = 2.05$) and attitude toward use ($M = 2.18$) were also moderate and not significantly different from 2.12. The behavioral-intention items indicate willingness to integrate LMSs but not clearly strong commitment. The attitude result should be interpreted carefully because the reconstructed attitude items primarily describe system capabilities such as accessible content, learning-material management, multiple functions, and personalized experiences rather than purely evaluative feelings toward use. This operationalization may have contributed to the comparatively weak correlations involving attitude discussed later.

Actual use produced a mean of 1.88 and was significantly lower than the moderate benchmark, $t(36) = -3.43$, $p = .002$. The strongest single actual-use item was reducing paper use ($M = 1.57$), followed by revisiting subject content and downloading lecture materials. These patterns suggest that LMS use among the sampled instructors was especially visible in document distribution and administrative efficiency. The result should not be interpreted as evidence that advanced pedagogical functions were absent, but it does indicate that easily observable, practical functions were among the most strongly endorsed uses. This is consistent with acceptance research showing that perceived benefits and accessible functionality can sustain system use (Al-Fraihat et al., 2020; Kim et al., 2021).

The overall challenge score was 1.99, categorized as moderately challenging, and did not significantly differ from the moderate benchmark, $t(36) = -1.78$, $p = .084$. The appendix output identifies insufficient school-member commitment to the transformation process as the strongest challenge signal ($M = 1.81$, $p = .004$ against the benchmark), although the mean still falls within the moderate-challenge band. Other reported concerns included technology proficiency, unclear implementation expectations, inconsistent implementation processes, leadership involvement, and the limited availability of platforms or tools. These results reinforce the argument that successful LMS integration requires more than individual technical skill; facilitating conditions, organizational support, and perceived value can also shape acceptance (Abdullah & Ward, 2016; Waris & Hameed, 2023).

Relationships Among TAM Variables

Table 2 presents the nine bivariate relationships. Four relationships were statistically significant: perceived ease of use with perceived usefulness, perceived usefulness with actual use, perceived usefulness with behavioral intention, and behavioral intention with actual use. Five relationships were not significant at $\alpha = .05$.

Table 2. Pearson correlations among LMS acceptance constructs.

Relationship	r	p	Magnitude	Decision
U - E	.404	.013	Moderate positive	Significant
U - A	.125	.462	Very weak positive	Not significant
E - A	.246	.142	Weak positive	Not significant
A - AU	.314	.058	Weak positive	Not significant
U - AU	.516	.001	Moderate positive	Significant
E - AU	.117	.491	Very weak positive	Not significant
U - BI	.607	< .001	Strong positive	Significant
BI - AU	.657	< .001	Strong positive	Significant
A - BI	.210	> .05	Weak positive	Not significant

Note. $n = 37$. U = perceived usefulness; E = perceived ease of use; A = attitude toward LMS use; BI = behavioral intention; AU = actual use. The source thesis reported A-BI as nonsignificant; the exact p value was not visible in the reproduced table.

Ease of use and usefulness were moderately and positively associated, $r = .404$, $p = .013$. This is consistent with the basic TAM proposition that a system requiring less effort is more likely to be perceived as useful. The result is also consistent with systematic evidence that perceived ease of use and perceived usefulness remain central and related acceptance beliefs across educational technologies (Granić & Marangunić, 2019). For implementation, the practical implication is not merely to simplify interfaces; institutions should make common physics-teaching workflows posting materials, administering assessments, communicating feedback, and organizing resources easy enough that instructors can readily see their instructional value.

Perceived usefulness was moderately associated with actual use, $r = .516$, $p = .001$, and strongly associated with behavioral intention, $r = .607$, $p < .001$. These two results are among the most theoretically coherent findings in the study. Meta-analytic research on teachers' technology acceptance has consistently identified usefulness as an important predictor of intention, although effect sizes vary across settings (Scherer & Teo, 2019; Scherer et al., 2019). In LMS-specific research, perceived usefulness similarly appears as an important pathway through which system and user factors affect acceptance (Fearnley & Amora, 2020). The present findings therefore suggest that instructors' judgments about the practical value of LMSs may matter more than a general impression that the system is easy to operate.

Behavioral intention had the strongest observed relationship with actual use, $r = .657$, $p < .001$. This supports the behavioral logic of TAM: instructors who report stronger commitment to use the LMS also report more frequent LMS use. Comparable patterns have been observed in studies of LMS and platform acceptance in higher education, where intention functions as a proximal correlate or predictor of actual usage behavior (Al-Marroof & Al-Emran, 2018; Yakubu et al., 2020). Because the present study is cross-sectional, however, the correlation does not establish that intention caused later use; it only shows that the two were strongly associated in the sampled instructors.

By contrast, perceived usefulness was only very weakly related to attitude ($r = .125$, $p = .462$), ease of use was weakly related to attitude ($r = .246$, $p = .142$), and attitude was weakly related to behavioral intention ($r = .210$, $p > .05$). Attitude and actual use showed a weak correlation that approached but did not reach the .05 threshold ($r = .314$, $p = .058$). These results diverge from versions of TAM in which attitude serves as a strong mediator. Two features of this study may help explain the divergence. First, the sample was small, limiting power to detect modest associations. Second, the reconstructed attitude items emphasize LMS functions more than affective evaluation, which may reduce conceptual separation from usefulness or system capability. This interpretation is consistent with research showing that the measurement of acceptance constructs can influence the apparent structure of teacher technology-acceptance models (Scherer et al., 2020).

Finally, ease of use and actual use were only very weakly related, $r = .117$, $p = .491$. Ease therefore did not appear sufficient by itself to explain how often instructors used the LMS. This does not make usability unimportant; rather, the significant E-U relationship suggests an indirect route in which ease may contribute to use primarily by making the system seem more useful. LMS reviews likewise emphasize that acceptance is multidimensional and can depend on system quality, user characteristics, facilitating conditions, and other contextual factors beyond the core TAM constructs (Al-Nuaimi & Al-Emran, 2021; Cavus et al., 2022).

Integrated Interpretation

Taken together, the results point to a usefulness-intention-use pattern. Perceived usefulness was significantly related to both behavioral intention and actual use, and behavioral intention was strongly related to actual use. Perceived ease of use was associated with usefulness but not directly with actual use or attitude. This configuration is compatible with the view that instructors may tolerate a system that is not exceptionally easy if it demonstrably supports their teaching, whereas a simple system that lacks visible instructional value may not generate sustained use.

The findings also distinguish LMS availability from pedagogical integration. Stronger endorsement of paper reduction, content access, and material distribution indicates clear administrative and logistical value. The more moderate scores for behavioral intention, attitude, and some advanced ease-of-use functions suggest room for deeper integration. For physics education, this deeper use could involve structured problem-solving resources, formative

assessment, multimedia representations, laboratory preparation, feedback cycles, and online discussion tied directly to course outcomes. Such uses should be introduced as solutions to disciplinary teaching problems rather than as generic technology requirements.

The challenge results further imply that implementation should be treated as an organizational process. Individual training is necessary but may be insufficient when expectations are unclear, implementation is inconsistent, or institutional commitment is weak. Recent faculty-focused LMS research supports combining user capability development with system quality, facilitating conditions, and organizational support (Fearnley & Amora, 2020; Waris & Hameed, 2023). Thus, the practical target is not simply to increase the number of LMS logins, but to create conditions in which instructors recognize the platform as useful, have the competence to exploit relevant features, and intend to continue using it for authentic teaching tasks.

CONCLUSIONS AND RECOMMENDATIONS

First, university physics instructors showed moderate agreement across perceived usefulness, perceived ease of use, behavioral intention, attitude toward use, and actual LMS use. Perceived usefulness and actual use were significantly stronger than the midpoint of the moderate category, indicating relatively favorable responses within the study's scoring system. The item pattern suggests that practical functions, especially resource access, material distribution, and reduced paper use, were prominent aspects of LMS value and use.

Second, LMS use was moderately challenging overall. The strongest challenge signal concerned institutional or school-member commitment to the transformation process, while technology proficiency, implementation clarity, systematic integration, leadership support, and platform limitations also appeared in the challenge set. These findings indicate that barriers are not purely technical and should be addressed at both instructor and institutional levels.

Third, four of the nine tested relationships were statistically significant. Ease of use was moderately related to usefulness; usefulness was moderately related to actual use and strongly related to behavioral intention; and behavioral intention was strongly related to actual use. The remaining relationships involving attitude and the direct path from ease of use to actual use were not significant. Within this sample, perceived usefulness and behavioral intention therefore emerged as the most consequential correlates of LMS use. These are associations rather than causal effects, and the results should be interpreted within the limits of the cross-sectional design and small convenience sample.

FURTHER STUDY

Several limitations delimit the conclusions of this study. The 37 participants were selected through convenience sampling from institutions in Benguet and Baguio City; consequently, the sample is not statistically representative of all university physics instructors in the Philippines. The cross-sectional design also prevents temporal or causal inference. Significant correlations indicate association, not proof that one construct produces change in another.

The measures were self-reported and reconstructed from prior instruments and literature. Some items do not map cleanly onto the conventional wording of their intended constructs for example, several attitude items describe LMS capabilities rather than evaluative affect, and some ease-of-use items represent system functionality rather than effort alone. Although the thesis reports strong overall content validity and internal consistency, future work should establish construct-specific reliability and factorial validity. The source manuscript also did not report diagnostics for normality, linearity, influential outliers, or other assumptions underlying Pearson correlation and one-sample t tests.

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