COLOMBO SCIENTIFIC PUBLISHING

INTERNATIONAL JOURNAL OF MULTIVARIATE DATA ANALYSIS THEORY & PRACTICE
E-ISSN: 2536-7935
P-ISSN: 2536-7927
PAGE NO: 08-14

An Empirical Model for Evaluating Determinants Influencing the Effective Use of Learning Management Systems in TVET Environments

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ARTICLE INFO

Article history:
Published: June 22, 2026
VOLUME: Vol.11 Issue 06 2026

Keywords:
Learning Management Systems, TVET, Technology Acceptance Model, System Quality, User Behavior, Digital Learning, Structural Equation Modeling, Educational Technology, LMS Effectiveness

ABSTRACT

The integration of Learning Management Systems (LMS) within Technical and Vocational Education and Training (TVET) institutions has transformed instructional delivery, learner engagement, and institutional efficiency. However, disparities in effective usage persist due to varying technological, behavioral, and institutional determinants. This study develops an empirical model to evaluate the critical factors influencing LMS effectiveness in TVET environments. Grounded in the Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), and Information Systems Success Model, the study synthesizes behavioral, technical, and contextual determinants into a multidimensional analytical framework. Using a quantitative research design, the model incorporates constructs such as perceived usefulness, system quality, user satisfaction, technical support, and institutional readiness. The findings reveal that system interactivity, perceived ease of use, and organizational support significantly influence LMS effectiveness, while socio-cognitive factors moderate user engagement. The study contributes to theoretical advancement by integrating multiple acceptance frameworks and offers practical implications for optimizing LMS deployment in TVET institutions.

1. INTRODUCTION

1.1 Background and Problem Statement

The rapid digitalization of education has positioned Learning Management Systems (LMS) as central tools in facilitating instructional delivery and learner engagement, particularly within Technical and Vocational Education and Training (TVET) institutions. These systems enable content dissemination, assessment management, and interactive learning environments, aligning with the evolving demands of workforce-oriented education. Despite widespread adoption, the effective use of LMS remains inconsistent across institutions, highlighting a critical gap between implementation and utilization efficiency.

Previous studies have emphasized that LMS adoption does not guarantee optimal usage outcomes due to diverse influencing factors such as user attitudes, system usability, and institutional support (Ahmad et al., 2023). In TVET contexts, where practical skill development is essential, ineffective LMS usage can significantly hinder learning outcomes and workforce preparedness.

1.2 Research Relevance and Objectives

This study addresses the need for a comprehensive analytical framework that evaluates determinants influencing LMS effectiveness in TVET environments. The primary objectives include:

- Developing an empirical model integrating behavioral, technical, and institutional factors
- Identifying key determinants influencing LMS effectiveness
- Evaluating the relationships between system quality, user behavior, and learning outcomes
- Providing actionable insights for optimizing LMS usage in TVET institutions

1.3 Scope and Significance

The study focuses on TVET institutions, where LMS integration plays a critical role in bridging theoretical and practical learning. By synthesizing multiple theoretical models, this research contributes to both academic literature and institutional practice. It also aligns with global educational transformation strategies emphasizing digital learning systems (UNESCO, 2022).

2. LITERATURE REVIEW

2.1 Theoretical Foundations of LMS Adoption

The Technology Acceptance Model (TAM) remains a foundational framework in understanding LMS usage, emphasizing perceived usefulness and perceived ease of use as primary determinants (Davis, 1989). Subsequent extensions, including UTAUT, incorporate social influence and facilitating conditions, providing a broader perspective on technology adoption (Venkatesh et al., 2012).

Empirical studies in TVET contexts indicate that user perception significantly influences LMS acceptance and usage behavior (Ahmad et al., 2023). This highlights the importance of aligning system design with user expectations.

2.2 System Quality and Technical Determinants

System quality, including reliability, usability, and interactivity, is a critical determinant of LMS effectiveness. Baleghi-Zadeh et al. (2017) emphasize that system interactivity and technical support directly influence LMS utilization. Similarly, DeLone and McLean (1992) identify system quality as a core component of information system success.

Gamification and interface design have also been shown to enhance user engagement and learning outcomes (Cheng, 2021). These findings suggest that technical enhancements can significantly improve LMS effectiveness.

2.3 Behavioral and Cognitive Factors

Behavioral theories, including social cognitive theory (Bandura, 1986), highlight the role of self-efficacy and motivation in technology adoption. Studies indicate that user attitudes, influenced by perceived benefits and social norms, significantly impact LMS usage (Fishbein & Ajzen, 1975).

In TVET environments, user diversity in terms of experience and digital literacy further complicates adoption patterns (Edeh et al., 2021). Therefore, behavioral determinants must be integrated into any comprehensive LMS evaluation model.

2.4 Institutional and Contextual Influences

Institutional support, including training and infrastructure, plays a vital role in LMS effectiveness. Research indicates that organizational readiness and policy frameworks significantly influence system utilization (Sayaf, 2021). Additionally, global initiatives emphasize the importance of digital transformation in vocational education (UNESCO, 2022).

2.5 Research Gaps

Despite extensive research, existing studies often focus on isolated determinants rather than integrated frameworks. There is a lack of comprehensive models that simultaneously evaluate behavioral, technical, and institutional factors within TVET contexts. This study addresses this gap by proposing a multidimensional empirical model.

3. METHODOLOGY

3.1 Research Design

This study adopts a quantitative research approach using Structural Equation Modeling (SEM) to evaluate relationships among determinants. SEM enables the analysis of complex relationships between latent variables, making it suitable for LMS evaluation (Kline, 2011).

3.2 Conceptual Framework Development

The proposed model integrates three primary dimensions:

- Behavioral Factors: Perceived usefulness, ease of use, user attitude
- Technical Factors: System quality, interactivity, reliability
- Institutional Factors: Technical support, infrastructure, policy support

These dimensions are derived from established theoretical frameworks, including TAM, UTAUT, and the Information Systems Success Model.

3.3 Data Collection and Sampling

Data is collected from TVET students and instructors using structured questionnaires. A stratified sampling technique ensures representation across different institutions (Cochran, 1977). The sample size is determined based on statistical requirements for SEM analysis.

3.4 Measurement Model

Measurement constructs are validated using reliability and validity tests:

- Reliability: Cronbach's alpha (Nunnally, 1978)
- Construct Validity: Confirmatory Factor Analysis (Hair et al., 2010)
- Discriminant Validity: Fornell-Larcker criterion (Fornell & Larcker, 1981)

3.5 Data Analysis Techniques

The study employs SEM techniques to analyze relationships among variables. Model fit indices, including RMSEA and CFI, are used to evaluate model adequacy (Shi & Maydeu-Olivares, 2020).

4. RESULTS

The empirical analysis reveals that perceived usefulness and system quality are the most significant predictors of LMS effectiveness. Technical support also demonstrates a strong positive influence, indicating the importance of institutional backing. Behavioral factors, including user attitude and self-efficacy, act as mediators between system characteristics and usage outcomes.

Interestingly, system interactivity significantly enhances user engagement, confirming findings from previous studies (Baleghi-Zadeh et al., 2017). However, variability in user experience levels introduces inconsistencies in LMS utilization patterns.

The model demonstrates strong explanatory power, with high variance explained in LMS effectiveness. These findings validate the multidimensional nature of LMS determinants in TVET environments.

5. DISCUSSION

The findings reinforce the significance of integrating behavioral, technical, and institutional factors in evaluating LMS effectiveness. The strong influence of perceived usefulness aligns with TAM theory, confirming its continued relevance in digital learning contexts (Davis, 1989). Similarly, the role of institutional support highlights the importance of organizational readiness in technology adoption.

The results also extend previous research by demonstrating the mediating role of behavioral factors, suggesting that technical improvements alone are insufficient without user engagement. This supports findings by Ahmad et al. (2023), which emphasize the interplay between system design and user perception.

However, the study also identifies limitations, including variability in digital literacy among users and potential biases in self-reported data. Additionally, the cross-sectional design limits the ability to assess long-term usage patterns.

6. CONCLUSION

This study presents a comprehensive empirical model for evaluating determinants influencing LMS effectiveness in TVET environments. By integrating multiple theoretical frameworks, the research provides a holistic understanding of LMS utilization.

The findings highlight the critical role of system quality, perceived usefulness, and institutional support in driving effective LMS usage. The study contributes to academic literature by bridging gaps in existing models and offers practical insights for policymakers and educators.

Future research should explore longitudinal studies and incorporate emerging technologies such as AI-driven learning systems to enhance LMS effectiveness.

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