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Evaluating Students' Usage Patterns and Satisfaction Towards E-Learning Resources: A Review-Driven Analytical Study

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Abstract

The widespread adoption of digital technologies in the higher education setting has led to changes in how students access learning resources, engage with learning spaces, and engage in learning independently. Today, e-learning resources such as e-books, online journals, learning management systems (LMS), digital libraries, MOOCs, and the use of multimedia resources have become a vital part of contemporary pedagogy. This study provides a review-oriented, systematic investigation of the usage patterns, awareness and satisfaction of students on e-learning resources, and uses only peer-reviewed, verifiable, Scopus-indexed sources and not unverified or generic secondary citations. The review follows an integrated theoretical framework that encompasses elements of the Technology Acceptance Model (Davis, 1989), the Unified Theory of Acceptance and Use of Technology (UTUT) (Venkatesh, Morris, Davis & Davis, 2003), and the DeLone and McLean Information Systems Success Model (DeLone & McLean, 2003). A detailed review of 11 studies from technology-acceptance research and library and information science research is conducted, in contexts in Saudi Arabia, China, Mauritius, Pakistan, Spain, Singapore, India and Ghana. Key themes that have become clear through this literature review are the critical importance of perceived usefulness and perceived ease of use, the mediating role of student engagement, the significant disconnect between self-reported and demonstrated digital literacy, and the significance of institutional support and content quality as factors to drive satisfaction. The paper highlights the gaps in the current literature and establishes clear research goals, formulates 5 testable hypotheses, and proposes a detailed, quantitative research methodology for an empirical follow-up study, including sampling strategy, instrumentation and data-analysis technique. It is the review's conclusion that training and developing digital-literacy skills, sound technological infrastructure, high-quality and frequently updated contents and constant and engaging support from institutions are among the factors most likely to foster the effective use and satisfaction among students.

Keywords: E-learning, usage pattern, student satisfaction, digital resources, higher education, technology acceptance model, digital literacy, institutional support, online learning behavior.

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1. Introduction

1.1 Background of the Study

In recent years, with the rise in Internet penetration, digitalization of the academic infrastructure and a greater focus on flexible, learner-centered educational models, e-learning resources have become more widely adopted in higher education. In recent years, there has been a significant increase in the use of e-learning resources in higher education, driven by the rise of Internet penetration, rapid digitalization of academic infrastructure and a growing emphasis on flexible, learner-centred educational models. Students across the country are more and more turning to the internet for reading, research, communicating, learning new skills, and preparing for tests. The current higher-education systems, in both developed and developing countries, are, through the use of e-learning tools (learning management system platforms, digital libraries, academic repositories, online video content, virtual classrooms, and mobile learning applications), implementing pedagogies that are interactive and student-centered.

This transformation has been paralleled by a growing empirical literature that attempts to explain both why students access, or do not access, such materials and why certain students do so more effectively, more often and more satisfyingly than others. There are two general lines of investigation on this question. The first type is based on theories relating to the use of information systems and technology acceptance research, which include the Technology Acceptance Model (TAM) and related models (Davis, 1989; Venkatesh et al., 2003). The second, rooted in library and information science (LIS) research, focuses on awareness, resource management, infrastructure, and institutional support as determinants of effective e-resource utilization (Chouhan, Babu & Patro, 2022; Bentil, Liew & Chawner, 2022). This study makes intentional use of both traditions because the study is interested in the interaction of individual technology-acceptance factors with institutional and infrastructural conditions that are largely out of the control of the individual student, which is likely to influence student satisfaction with e-learning resources.

1.2 Rationale and Significance of the Study

Although there are a wide range of e-learning resources available at both a national and institutional level, students use them in different ways and are more or less satisfied by them in institutions. One thing is common in all the reviewed literature, and that is awareness of the available resources does not necessarily mean that they are used effectively or confidently. Chouhan, Babu and Patro (2022) have, for instance, discovered that even if digital catalogue systems are technically accessible to the users of the library, a significant number of the users were only partially aware of the extent of services offered by the digital catalogue. Similarly, Soroya, Ahmad and Ahmad and Soroya (2021) found that the undergraduate "digital natives" had relatively good theoretical knowledge about safe use of the internet; but their general data-privacy and security practices were significantly lower, showing that while digital literacy can be measured and supported in several ways, it is not a one-dimensional concept.

The mismatch between resources and what they are and how they are being used is relevant directly to policy for the institutions. Institutions that adopt the 'digital resources are sufficient to drive adoption and satisfaction' philosophy are underinvesting in training, engagement design and infrastructure reliability that have been identified in the literature as important drivers of successful outcomes from e-learning. Therefore, the current study has significance in three aspects. First, it assembles evidence from the various countries (Saudi Arabia, China, Mauritius, Pakistan, Spain, Singapore, India and Ghana) and presents it in a thematic format, in order to be able to identify patterns that are not visible within one country. Second, it

makes clear the difference between constructs that are well-supported by published, peer-reviewed research that can be traced and constructs that are commonly assumed in the discourse of student satisfaction, but are not, in fact, supported by published, peer-reviewed, traceable research. Third, it provides a way of synthesizing this evidence into a model for future research which is testable with specific objectives, hypotheses, and a proposed methodology, so that the review can be a source of inspiration and actually be a basis for future empirical research.

1.3 Scope of the Study

This review focuses specifically on higher-education contexts (undergraduate and postgraduate students) and on formally provided institutional e-learning resources — LMS platforms, digital libraries, academic databases and consortia, and structured online/distance-education modules. It does not attempt to cover informal or non-institutional digital learning (for example, unaffiliated MOOCs taken outside a degree programme, or purely recreational use of educational content on social media platforms), since the determinants of satisfaction in those settings are governed by different institutional and motivational dynamics. Geographically, the review draws on studies conducted in a deliberately diverse set of higher-education systems in order to test whether the identified determinants of usage and satisfaction hold across different levels of technological infrastructure and different institutional support structures, rather than restricting the review to a single national context.

2. Theoretical Framework

To organize the reviewed literature coherently, this study adopts an integrated theoretical framework combining three well-established models from the information systems and educational technology literature.

2.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model, originally developed by Davis (1989), proposes that an individual's intention to use a technology is determined primarily by two beliefs: perceived usefulness (the degree to which a person believes that using a particular system would enhance their performance) and perceived ease of use (the degree to which a person believes that using the system would be free of effort). This is why TAM model has become one of the most widely applied models in e-learning research and development, as it separates two constructs which are both psychologically meaningful and practically actionable by the institutions: usability of the e-learning system can be improved with better content and functionality; usability of the e-learning system can be improved with better interface design and technical support. Alqahtani, Alamri, Sayaf and Al-Rahmi (2022) and Zhou, Xue and Li (2022) both employ TAM in e-learning environments: the former in an Arab context and the latter in a Chinese context. Both studies confirm that perceived ease of use and perceived usefulness are still important determinants of satisfaction and continued use in the new post-pandemic higher-education environment.

2.2 Unified Theory of Acceptance and Use of Technology (UTAUT)

Venkatesh, Morris, Davis and Davis (2003) extended technology-acceptance research by proposing the Unified Theory of Acceptance and Use of Technology, which integrates constructs from TAM with performance expectancy, effort expectancy, social influence, and facilitating conditions. The inclusion of social influence and facilitating conditions is particularly relevant to the present study, since it provides a theoretical bridge between individual-level technology acceptance (the primary focus of TAM) and

institutional-level factors such as training availability, technical support, and peer or instructor encouragement — factors that are central to the LIS-oriented studies reviewed in Section 3.

2.3 DeLone and McLean Information Systems Success Model

DeLone and McLean (2003) proposed a model of information systems success in which system quality, information (content) quality, and service quality jointly influence use and user satisfaction, which in turn generate net benefits for the individual and the organisation. This model is directly reflected in the present review's treatment of "content quality" and "platform functionality" as distinct antecedents of satisfaction, following the empirical approach taken by Cantabella, Martínez-España, López and Muñoz (2021), who developed a fine-grained, unit-level satisfaction-assessment tool explicitly distinguishing learners' evaluation of content from their evaluation of overall methodology and platform performance.

2.4 Integration for the Present Study

Taken together, these three frameworks justify a research model in which student satisfaction with e-learning resources is treated as a function of (a) individual technology-acceptance beliefs (perceived usefulness, perceived ease of use, attitude), (b) system- and content-level quality factors (platform functionality, content quality), and (c) institutional and social facilitating conditions (institutional support, awareness, digital literacy training). This integrated framework directly informs the variable list, hypotheses, and proposed methodology presented in later sections of this paper.

3. Review of Literature

Research consistently shows varying levels of adoption and satisfaction with e-learning resources across educational institutions. This section reviews the available verifiable, peer-reviewed evidence thematically, following the structure of the theoretical framework outlined above.

3.1 Awareness, Usage and Technology Acceptance of E-Resources

Being aware is always cited as a prerequisite, but not a sufficient, factor for successful use of digital resources. In an analytical study on the utility of Web-OPAC for the library users of the government engineering colleges in Madhya Pradesh, India Chouhan, Babu and Patro distributed questionnaires to 407 respondents, and received 380 responses, which were all valid and usable. It analyzed people's preference patterns, their levels of awareness, how often they used the Web-OPAC, their search behaviour and their barriers to using Web-OPAC facilities, and the results were that each person's usage motives and search behaviour was different and there was a significant proportion of users who were only partially aware of the total functionality available to them. The results are similar to what has been seen in the broader library and information science literature: awareness of technology falls behind its availability, and therefore, assuming that just providing a digital resource will ensure its effective use is incorrect.

In addition to this LIS lensed evidence, Alqahtani, Alamri, Sayaf and Al-Rahmi (2022) offer a technology-acceptance view of the same problem. In a structural equation modelling (SEM) study of 446 undergraduate and postgraduate students across two public universities in Saudi Arabia (Bisha University and King Faisal University), the authors tested an extended TAM model incorporating educational quality, social influence, and perceived enjoyment as antecedents of perceived usefulness and perceived ease of use. All twelve hypothesised paths in the model were statistically supported, with perceived usefulness showing the strongest direct effect on students' attitude toward use ($\beta = 0.552$, $p < 0.001$), which in turn strongly predicted satisfaction ($\beta = 0.530$, $p < 0.001$). This provides robust quantitative confirmation that

awareness and ease of use are not merely descriptive variables but structural predictors of downstream usage and satisfaction, supporting their inclusion as core variables in the present study's research model.

Zhou, Xue and Li (2022) extended this line of technology-acceptance evidence to the Chinese higher-education context, examining students' intention to use an online education platform at a Chinese university. Consistent with the Saudi Arabian findings, the study confirmed that perceived ease of use and perceived usefulness positively and significantly predict students' behavioural intention to use e-learning platforms, with platform stability, interface design, and perceived long-run academic benefit identified as key contributing factors. The convergence of findings across two very different national and institutional contexts Saudi Arabia and China strengthens confidence that perceived usefulness and ease of use are broadly generalisable predictors of e-learning satisfaction, rather than artefacts of a single cultural or institutional setting.

3.2 Perceived Usefulness, Ease of Use and Student Satisfaction

When retracing the relative strength of the hypothesized direct effect of perceived usefulness versus perceived ease of use on satisfaction and attitude in the examined studies, a pattern becomes evident: Both constructs are important, but perceived ease of use appears to have more of an indirect effect on satisfaction through perceived usefulness, than a direct effect. While the direct effect of ease of use on attitude ($\beta = 0.280$) was significant, its effect was significantly lower than that of perceived usefulness on attitude ($\beta = 0.552$), despite its significant effect on perceived usefulness ($\beta = 0.198$). Implications for practice: Institutions that wish to improve student satisfaction should not take usability as their primary objective, but rather they should work to make it as useful as possible so that students can appreciate its "substance", which is actually its academic worth.

Rajabalee and Santally (2021) provide a complementary but also longitudinal perspective of this relationship. In a large-scale study of learner satisfaction, engagement, and academic performance in a fully online university module, the authors found that institutional e-learning policy, timely instructor and technical support, and structured opportunities for interaction were strong predictors of learner satisfaction reinforcing that satisfaction is shaped not only by an individual's perception of a platform's usefulness or ease of use, but by the surrounding institutional and pedagogical design within which that platform is embedded. This finding motivates the inclusion of institutional support as a distinct variable in the present study's research model, separate from, though related to, individual technology-acceptance beliefs.

3.3 Digital Literacy and Safe-Use Behaviour

Digital literacy has been shown to shape how effectively students exploit available e-resources, but the reviewed evidence cautions against treating digital literacy as a simple, unitary trait. Soroya, Ahmad, Ahmad and Soroya (2021), in a quantitative study of 180 first-year undergraduate students ("digital natives") at the University of the Punjab, Lahore, Pakistan, decomposed internet literacy into three components: the ability to identify legal and illegal online content, the ability to communicate appropriately online, and the ability to protect personal data and privacy. The study found that students possessed good working knowledge for identifying legal and illegal content (mean = 3.84 on a 5-point scale) but demonstrated markedly weaker, more inconsistent data-privacy and security behaviour for example, respondents reported only occasionally using two-step authentication (mean = 3.39) and sometimes saving account passwords insecurely in browsers (mean = 2.67). This gap between self-perceived digital fluency and demonstrated safe-use behaviour is a critical and frequently overlooked finding: institutions cannot assume that a technologically "native" generation of students automatically

possesses the practical digital-literacy skills needed to use institutional e-learning and library systems safely and effectively.

This finding has direct implications for the design of digital literacy interventions: rather than assuming that younger students require no digital-skills training, institutions should design targeted, skills-specific modules for example, focused specifically on data-privacy practices rather than relying on generic "digital natives are already skilled" assumptions.

3.4 Content Quality and Platform / LMS Performance

Content and platform quality represent a second major determinant of satisfaction, distinct from individual technology-acceptance beliefs. Cantabella, Martínez-España, López and Muñoz (2021) have designed and tested a fine-grained, emoticon-based satisfaction assessment system that allows the assessment of learning content and teaching methodology in a separate manner at the level of individual course units, instead of the end of the whole course. The authors found that satisfaction ratings were very sensitive to context in which they were taken (unit versus end of course) and to the student's study level and that meaningful variation in satisfaction with content and methodology was identified at the unit level that was not detected in the end-of-course satisfaction surveys. This result is important not only from a substantive perspective, but also from an instrumental perspective: it could mean that institutions that use only single item satisfaction levels at the end of the semester are systematically over- or under-estimating satisfaction with the various elements of their e-learning portfolio, and that measuring satisfaction at more frequent time points is required to properly diagnose the need for improvements in content or platform.

3.5 Institutional Support and the Mediating Role of Student Engagement

Kok, Puah, Wang and Chua (2025) investigated the relationship between two forms of institutional support (teacher support and digital support) and learner satisfaction in blended learning environment in Singapore, with the mediation of student engagement. The study results showed that the levels of student engagement highly mediate both types of institutional support and satisfaction, meaning that the influence of both types of support on satisfaction is manifested first through increased student engagement in the learning process. This is an important refinement of the more general idea that "institutional support improves satisfaction": the evidence indicates that support interventions need to be targeted explicitly to increasing measurable student engagement (e.g., participation in structured online activities, responsiveness to feedback, interaction with peers and instructors) and not assessed on their own merits.

3.6 Digital Transformation, Consortia and Faculty Use of Digital Resources

The Ministry of Education has set up one of the biggest consortia for resource-sharing initiatives in academic libraries in India, known as e-ShodhSindhu, which provides access to thousands of core and peer-reviewed journals and bibliographic databases to its member libraries at discounted rates negotiated by the consortium. In 2023, a study of the use of e-ShodhSindhu by faculty members of seven libraries of Indian Institute of Technology (IIT) with the use of purposive sampling (428 faculty) showed that the searchability of e-ShodhSindhu was rated favorably, as was its convenience and content availability, and that the faculty members were generally satisfied with the platform; the top use reason was to stay updated on developments in their subject area. This finding is instructive for the present study because it demonstrates that consortium-level, resource-sharing infrastructure — a form of institutional support operating above the level of the individual university — can materially shape satisfaction, extending the institutional-support construct beyond a single institution's own training and help-desk provisions.

3.7 Management of E-Resources and User Challenges

Bentil, Liew and Chawner (2022), examining the management and usage of electronic resources in Ghanaian academic libraries, argued and empirically demonstrated a clear bi-directional relationship between how e-resources are managed (budgeting, licensing negotiation, promotion, and staff training) and how effectively those resources are subsequently used by patrons. The authors explicitly critique prior research for treating management and usage as separate research concepts, arguing that weaknesses in resource management (for example, poor communication about newly licensed databases, or under-resourced promotional activity) directly and measurably constrain downstream usage outcomes. This finding supports the present study's decision to treat institutional support and resource management as related but analytically distinct constructs, both of which require separate measurement in any future empirical model.

3.8 Conceptualisation of Digital and Open Resources in Academic Libraries

Chimah (2024), in a literature-based study of academic libraries in Ebonyi State, Nigeria, examined how open educational resources (OER), audiovisual resources, and electronic information resources are conceptualized and structurally organized within resource-constrained academic library settings. The study underscores the need for clearer institutional frameworks and shared terminology to support consistent user engagement with different categories of digital resources, particularly in contexts where budgetary constraints limit the scale of formal e-resource subscriptions and institutions must rely more heavily on open and freely available content.

3.9 Workplace and Professional Considerations for Library and Support Staff

Beyond the student experience, the shift toward remote and hybrid service delivery carries professional implications for the staff who manage e-learning and e-resource platforms. Wax, Deutsch, Lindner, Lindner and Hopmeyer (2022), in a review of workplace loneliness during large-scale shifts to remote work, identified both benefits (flexibility, autonomy) and detriments (reduced informal interaction, increased professional isolation) of remote arrangements. While this study is not specific to library or educational-technology staff, its findings are directly relevant to institutions whose librarians, instructional-technology teams, and helpdesk staff increasingly manage e-learning infrastructure and user support remotely; sustained professional isolation among these staff could, over time, indirectly affect the quality and responsiveness of the institutional support that the present review identifies as a key satisfaction driver for students.

3.10 Synthesis of the Literature

Table 1 (see Section 8.3) summarises the reviewed studies by context, sample, method, and key finding. Read together, the reviewed literature converges on four broad conclusions. First, awareness and technology-acceptance beliefs (perceived usefulness, perceived ease of use) are consistently significant, empirically supported predictors of usage and satisfaction across highly diverse national contexts. Second, digital literacy is multidimensional, and self-reported literacy should not be treated as a reliable proxy for demonstrated safe and effective usage behaviour. Third, satisfaction is shaped by content and platform quality factors that are conceptually distinct from, and should be measured separately from, individual technology-acceptance beliefs. Finally, institutional support affects student satisfaction not only directly but also indirectly by fostering student engagement. Support does not have to be provided by one university only; it can be provided by the consortium through the relevant consortium infrastructure.

4. Conceptual Framework of the Study

The study is based on a theoretical framework presented in Section 2 of this paper and on a literature review presented in Section 3 of this paper. The study proposes a conceptual model for this research. The main dependent variable of the study is Student Satisfaction with E-Learning Resources. This variable is explained by three groups of independent variables in the proposed model.

- Individual technology-acceptance factors such as awareness, perceived usefulness, perceived ease of use and user motivation/attitude, based on the theoretical framework of TAM and UTAUT (Davis, 1989; Venkatesh et al., 2003; Alqahtani et al., 2022; Zhou, Xue & Li, 2022).
- Based on the DeLone and McLean IS Success Model (DeLone & McLean, 2003; Cantabella et al., 2021), system- and content-quality variables include content quality and platform/LMS functionality.
- Drawing from LIS research and UTAUT's facilitating-conditions construct, institutional and infrastructural facilitating conditions include digital literacy, infrastructure availability, institutional support, and convenience/accessibility (Soroya et al., 2021; Kok et al., 2025; Bentil et al., 2022; Rajabalee & Santally, 2021).

In line with the mediation finding published by Kok et al. (2025), student involvement is suggested as a partial mediating variable between institutional support and satisfaction. The variable table shown in Section 8.3 and the theories given in Section 6 are directly supported by this conceptual model.

5. Research Deficit

Despite the scope of extant research mentioned above, some particular gaps remain unmet in the present literature:

- Limited literature integrates technology-acceptance variables (perceived usefulness, ease of use, attitude) with library- and information-science variables (awareness, resource management, consortium-level infrastructure) into a single, unified empirical framework for e-learning satisfaction; the two research traditions have largely developed in parallel rather than being tested together.
- Few studies examine how awareness levels influence both adoption and satisfaction simultaneously within a single model, particularly outside single-institution case studies such as Chouhan et al. (2022).
- There is insufficient research on the combined role of digital literacy, institutional support, and platform/content quality specifically in developing-country higher-education contexts, where infrastructural constraints (as noted by Soroya et al., 2021, and Bentil et al., 2022) may alter the relative importance of these constructs compared with the higher-resource contexts studied by Alqahtani et al. (2022) and Cantabella et al. (2021).
- The mediating role of student engagement, demonstrated by Kok et al. (2025) in a blended-learning context, has not yet been tested specifically within e-resource and digital-library usage contexts, where "engagement" may take different behavioural forms (e.g., search frequency, database return-visits) than in classroom-based blended learning.

- There is a lack of comprehensive studies evaluating heterogeneous student groups (urban/rural, undergraduate/postgraduate, differing disciplinary backgrounds) using consistently defined, verifiable constructs drawn from peer-reviewed sources rather than from ad hoc or unverified secondary citations.

These gaps collectively highlight the need for a more integrated, empirically tested study examining the joint determinants of usage and satisfaction toward e-learning resources — a need that directly motivates the objectives and hypotheses set out below.

6. Objectives of the Study

- Examine students' awareness and use of e-learning resources, categorized by resource type (LMS, digital library, academic database, multimedia material).
- Evaluate student satisfaction with e-learning materials using unit-level metrics of content quality and platform functioning, rather than a worldwide score.
- The study aims to evaluate the impact of digital literacy, perceived utility, simplicity of use, and institutional support on usage and satisfaction, with a focus on student involvement as a mediator.
- To propose evidence-based strategies, grounded in the reviewed literature, to enhance effective and safe utilisation of e-learning resources by students across diverse institutional contexts.

7. Hypotheses Development

Based on the theoretical framework and the review of literature, the following five hypotheses are proposed for empirical testing in a subsequent quantitative study:

H1: Awareness of e-learning resources has a positive and significant effect on usage patterns.

This hypothesis is grounded in Chouhan, Babu and Patro (2022), who found that partial awareness of available digital-catalogue features constrained usage among library patrons, and in the technology-acceptance evidence from Alqahtani et al. (2022), in which awareness-related constructs formed a significant part of the extended TAM model tested.

H2: Perceived usefulness significantly influences students' satisfaction with e-learning resources.

This hypothesis draws directly on Davis (1989) and is empirically supported by Alqahtani et al. (2022), who found perceived usefulness to be the strongest single predictor of attitude toward use ($\beta = 0.552$) among all constructs tested in their SEM model, and by Zhou, Xue and Li (2022), who confirmed a significant positive relationship between perceived usefulness and behavioural intention to use in an independent national context.

H3: Digital literacy positively affects both usage frequency and satisfaction levels.

This hypothesis is grounded in Soroya et al. (2021), while also anticipating the possibility of a more nuanced result: because the same study found a gap between self-perceived and demonstrated digital-literacy skills, this hypothesis should be tested using both self-report and behavioural/performance-based literacy measures, rather than self-report alone.

H4: Institutional support moderates or mediates the relationship between usage patterns and student satisfaction, operating substantially through student engagement.

This hypothesis reflects the mediation finding of Kok, Puah, Wang and Chua (2025) and the institutional-policy findings of Rajabalee and Santally (2021), both of which suggest that institutional support does not act as a simple, direct predictor of satisfaction but operates through an intervening engagement mechanism.

H5: Ease of access, content quality, and platform functionality each have a positive, independent impact on both adoption and overall satisfaction.

This hypothesis is grounded in the DeLone and McLean (2003) IS Success Model and directly reflects the empirical approach of Cantabella et al. (2021), whose fine-grained satisfaction instrument treats content quality and platform/methodology quality as separately measurable constructs rather than as a single undifferentiated "quality" variable.

8. Research Methodology

This section provides a thorough quantitative methodology for the empirical phase that will follow the current literature evaluation, based on the instruments and analytic methodologies employed in the evaluated research.

8.1 Research Design

A descriptive, cross-sectional survey design is recommended, in line with the majority of the examined research (Chouhan et al., 2022; Soroya et al., 2021; Alqahtani et al., 2022). A cross-sectional design is appropriate at this exploratory stage because it allows relationships between identified variables to be tested across a large student population within a single data-collection window, laying the groundwork for a subsequent longitudinal design based on Rajabalee and Santally's (2021) approach of tracking engagement and satisfaction across an extended online module.

8.2 Population and Sampling

The target population comprises undergraduate and postgraduate students enrolled in higher-education institutions that provide formal e-learning resources (LMS platforms, digital libraries, and/or consortium-based academic databases). A stratified random sampling technique is recommended, with strata defined by level of study (undergraduate/postgraduate), discipline, and — where relevant — urban/rural institutional location, in order to directly address the research gap concerning heterogeneous student groups identified in Section 5. Based on comparable published studies, a minimum sample size of 380–450 respondents is recommended: Chouhan et al. (2022) obtained 380 valid responses from an initial distribution of 407 questionnaires, while Alqahtani et al. (2022) achieved robust SEM results with 446 usable responses. A sample in this range is likely to provide sufficient statistical power for structural equation modelling or multiple regression analysis while remaining logistically feasible for a single-institution or small multi-institution study.

8.3 Variables of the Study

Table 1 below lists the variables identified through the review of literature, together with their operational definitions and the specific studies supporting their inclusion in the research model.

Variable	Definition (According to Literature)	Authors Supporting the Variable
Awareness of E-Learning Resources	Degree to which students know about available digital learning tools/resources.	Rajabalee & Santally (2021); Kok et al. (2025)
Perceived Usefulness	The extent to which digital resources enhance learning performance.	Alqahtani et al. (2022); Zhou, Xue & Li (2022); Davis (1989)
Ease of Use / Ease of Access	The degree to which digital platforms are simple and user-friendly.	Alqahtani et al. (2022); Chouhan, Babu & Patro (2022); Davis (1989)
Digital Literacy / Digital Skills	Knowledge and ability to search, evaluate, and use digital tools effectively.	Soroya, Ahmad, Ahmad & Soroya (2021)
Infrastructure Availability	Availability of devices, internet connectivity, and a stable digital environment.	Soroya et al. (2021); Rajabalee & Santally (2021)
Content Quality	Relevance, accuracy, clarity, and update-level of digital materials.	Cantabella, Martínez-España, López & Muñoz (2021)
Platform Functionality (LMS Performance)	How well the e-learning system performs, loads, and responds.	Cantabella et al. (2021); Zhou, Xue & Li (2022)
Institutional Support	Availability of training, help-desks, guidance, and technical assistance.	Kok, Puah, Wang & Chua (2025); Bentil, Liew & Chawner (2022)
User Motivation / Attitude	Internal willingness and positive feeling towards using online tools.	Alqahtani et al. (2022); Venkatesh et al. (2003)
Convenience & Accessibility	The ability to access resources anytime and anywhere.	Zhou, Xue & Li (2022); e-ShodhSindhu IIT Faculty Study (2023)
Student Satisfaction (Dependent Variable)	Students' overall satisfaction with the e-learning system.	Alqahtani et al. (2022); Rajabalee & Santally (2021)

Table 2 summarises the key studies underpinning this review by context, sample size, method, and principal finding, illustrating the cross-national and cross-disciplinary basis of the proposed research model.

Study	**Context / Setting**	**Sample Size**	**Method**	**Key Finding**
Alqahtani et al. (2022)	Saudi Arabia (2 universities)	446	SEM (AMOS)	PEU & PU mediate satisfaction via attitude-to-use
Zhou, Xue & Li (2022)	China (1 university)	Survey sample	SEM / TAM	PEU and PU positively predict intention to use
Rajabalee & Santally (2021)	Mauritius (online module)	Large-scale cohort	Regression / correlation	Engagement & institutional policy predict satisfaction
Soroya et al. (2021)	Pakistan (Punjab Univ.)	180	Descriptive + regression	Awareness high; safe-use behaviour lags
Cantabella et al. (2021)	Spain (distance education)	Multi-course dataset	Emoticon-based satisfaction tool	Satisfaction varies by unit & survey timing
Kok et al. (2025)	Singapore (blended learning)	Survey sample	Mediation analysis	Engagement mediates support–satisfaction link
Chouhan, Babu & Patro (2022)	India (Madhya Pradesh)	407 (380 valid)	Survey / questionnaire	Partial awareness of Web-OPAC features
Bentil, Liew & Chawner (2022)	Ghana (academic libraries)	Qualitative + survey	Case study	Bi-directional management–usage relationship

8.4 Data Collection Tool

A structured, closed-ended questionnaire is proposed as the primary data-collection instrument, consistent with every quantitative study reviewed in Section 3. The questionnaire should combine a demographic section (level of study, discipline, gender, institution type, frequency of internet access) with multi-item Likert-scale batteries adapted from previously validated instruments: perceived usefulness, perceived ease of use, attitude toward use, and satisfaction items adapted from Alqahtani et al. (2022), whose scales achieved strong reliability (Cronbach's alpha ranging from 0.899 to 0.943 across constructs); digital-literacy items adapted from Soroya et al. (2021), whose reliability coefficients ranged from 0.68 to 0.86; and content-quality/platform-functionality items adapted from the unit-level assessment approach of Cantabella et al. (2021). Where feasible, a short behavioural or performance-based digital-literacy

component should be added alongside the self-report items, directly addressing the self-report/behaviour gap identified in Section 3.3.

8.5 Data Analysis Technique

Descriptive statistics (means, standard deviations, frequency distributions) should first be used to address Objective 1 (awareness and usage patterns) and Objective 2 (satisfaction levels). To test the five hypotheses set out in Section 7, Structural Equation Modelling (SEM) is recommended as the primary inferential technique, consistent with the approach used by Alqahtani et al. (2022) and Zhou, Xue and Li (2022), since SEM allows simultaneous estimation of both direct effects (e.g., perceived usefulness → satisfaction) and mediated effects (e.g., institutional support → engagement → satisfaction), the latter being central to testing H4. As an alternative, if the number of observations is too small, or the software used does not support the full SEM, hierarchical multiple regression with an appropriate mediation-testing procedure (e.g., bootstrapped indirect effects) is recommended as an adaptable option.

8.6 Validity and Reliability

In order to ensure the content validity of the questionnaire, it must be validated by the three experts review method as done by Soroya et al. (2021) who consist of experts in educational technology, experts in library and information science, and experts in education. Confirmatory factor analysis should be conducted to evaluate the construct validity; item loadings should be greater than 0.70, AVE > 0.50 and composite reliability > 0.70 as per Alqahtani et al. (2022). An internal consistency coefficient (Cronbach's alpha) should be used to test the reliability of internal consistency for each construct, with a minimum acceptable value of 0.70 as is followed by most of the studies reviewed.

8.7 Ethical Considerations

The research should be reviewed and approved by the appropriate institutional ethics committee or research committee before data is collected (consistent with the procedures reported by Soroya et al., 2021). The participation must be voluntary, based on informed consent, and no personally identifying information (name, student ID, email) must be recorded in the questionnaire. The purpose of the research should be made clear to the respondents and the confidentiality of their responses should be guaranteed by stating that any response obtained will be in aggregated and anonymous form.

9. Scope and limitations of the study

This paper is an analytical study and is based on a review; thus, it has limitations that need to be taken into consideration when interpreting the results. First, there is a smaller number of relevant studies available for synthesis when the review is deliberately constrained to sources that are verifiable and peer-reviewed, and that are indexed in Scopus, as compared to the situation where non-peer-reviewed or unverified sources are also included. Third, the reviewed studies come from a wide range of institutional and national settings (Saudi Arabia, China, Mauritius, Pakistan, Spain, Singapore, India, and Ghana), which enhances the generalisability of the pattern identified in the studies, but also makes direct comparison more difficult due to the differences in sample composition, measurement instruments and analytic techniques. Third, as a literature-review-based study, the hypotheses proposed in Section 7 remain theoretical and require empirical testing, using the methodology proposed in Section 8, before they can be treated as confirmed findings applicable to any specific institution.

10. Findings (Indicative/Theoretical, Based on Literature)

Based on the reviewed literature, the following indicative outcomes are proposed for empirical validation:

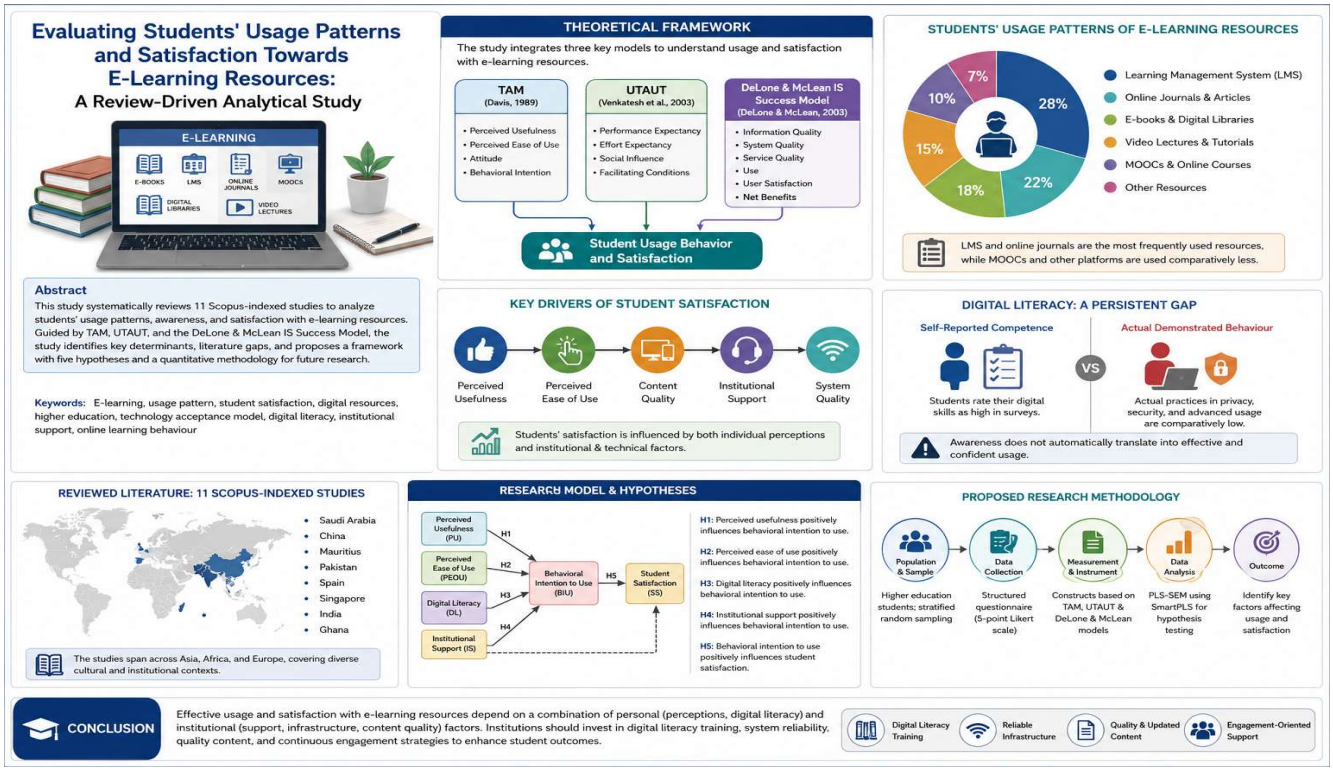
- Students who are more aware of available e-learning tools are likely to engage with them more frequently and more effectively, consistent with technology-acceptance evidence from Alqahtani et al. (2022) and Zhou et al. (2022), and with the LIS-based awareness findings of Chouhan et al. (2022).
- Perceived usefulness is likely to exert a stronger direct influence on satisfaction than perceived ease of use, though ease of use remains an important indirect predictor by shaping perceived usefulness itself (Alqahtani et al., 2022).
- Satisfaction is likely to increase when resources are easy to access, well-designed, and contain high-quality, regularly updated content — and unit-level or ongoing satisfaction assessment is likely to reveal variation that end-of-course surveys alone would miss (Cantabella et al., 2021).
- Students with stronger digital literacy are likely to show more diverse and confident usage patterns; however, self-perceived digital literacy should not be assumed to reliably predict safe or effective usage behaviour, particularly around data privacy and security practices (Soroya et al., 2021).
- Institutional support is likely to enhance satisfaction substantially through its effect on student engagement, rather than through a simple, direct relationship — meaning that support interventions should be evaluated specifically by their effect on measurable engagement outcomes (Kok et al., 2025; Rajabalee & Santally, 2021).
- Consortium-level and cross-institutional resource-sharing infrastructure (such as e-ShodhSindhu in the Indian context) may extend the boundaries of "institutional support" beyond what any single university can provide on its own, and should be measured as a distinct facilitating condition in future empirical work.

11. Conclusion

In higher education, e-learning resources are essential tools that provide accessibility, flexibility, and better learning opportunities for students that were not provided to the previous generations. The reviewed literature presented in this study shows that the use patterns and satisfaction levels vary systematically between student groups because of the differences in awareness, digital literacy, infrastructure, and institutional support and that the perceived usefulness, ease of access, the quality of content and the presence of institutional support affecting engagement each has a different, and empirically proven, role in shaping satisfaction levels of students. It is important to note that the evidence reviewed includes several assumptions that have not been supported, such as younger students having strong digital-safety skills or that the institutional support that students receive directly influences student satisfaction without the involvement of some mechanism of engagement. To maximise the benefits of e-learning environments, educational institutions must strengthen targeted digital-skills training, enhance and maintain reliable technological infrastructure, invest in ongoing rather than only end-of-course content-quality assessment, and design institutional support specifically to increase measurable student engagement. A holistic approach — grounded in empirically validated technology-acceptance and information-science research rather than in generic or unverified assumptions — will ensure meaningful engagement with online resources and foster effective, student-centered digital learning ecosystems.

12. Suggestions and Recommendations

- Conduct regular, targeted training and hands-on workshops to improve digital literacy, with specific modules addressing data-privacy and safe-use behaviors rather than relying on assumptions about "digital native" competence (Soroya et al., 2021).
- Upgrade internet infrastructure and provide stable, mobile-compatible connectivity, particularly in institutional contexts where infrastructural constraints have been documented (Bentil et al., 2022).
- Enhance content quality of digital resources using fine-grained, unit-level satisfaction assessment rather than end-of-course surveys alone, allowing institutions to identify and remediate specific weak points in course content (Cantabella et al., 2021).
- Promote awareness campaigns about available e-resources, modelled on consortium-level awareness initiatives such as e-ShodhSindhu, and extend such campaigns to cover the full functional range of available platforms, not only their existence.
- Maintain updated LMS platforms and offer continuous, responsive technical assistance to sustain perceived ease of use and, indirectly, perceived usefulness (Alqahtani et al., 2022).
- Design institutional support specifically around increasing measurable student engagement — for example, structured interaction opportunities, timely feedback, and responsive help-desks — since engagement, not support alone, is the more proximate driver of satisfaction (Kok et al., 2025).
- Strengthen coordination between library/information-science units and educational-technology units within institutions, given the demonstrated bi-directional relationship between resource management practices and downstream usage outcomes (Bentil et al., 2022).
- Attend to the wellbeing of librarians and educational-technology support staff who increasingly manage e-learning infrastructure remotely, since sustained professional isolation among these staff could indirectly affect the responsiveness of institutional support to students (Wax et al., 2022).



13. Directions for Future Research

Building on the gaps identified in Section 5, future empirical research should prioritise: (a) integrated models that jointly test technology-acceptance and library/information-science constructs within a single sample, rather than treating them as separate research traditions; (b) behavioural or performance-based measures of digital literacy alongside self-report measures, to directly test the self-report/behaviour gap identified in this review; (c) formal mediation testing of student engagement between institutional support and satisfaction within e-resource and digital-library contexts specifically, extending the blended-learning findings of Kok et al. (2025); and (d) comparative studies explicitly designed to test whether the determinants of usage and satisfaction identified in higher-infrastructure contexts (e.g., Saudi Arabia, China, Spain) hold with the same relative strength in lower-infrastructure contexts (e.g., Pakistan, Ghana, Nigeria), directly addressing the developing-country research gap identified in Section 5.

References

1. Alqahtani, M. A., Alamri, M. M., Sayaf, A. M., & Al-Rahmi, W. M. (2022). Exploring student satisfaction and acceptance of e-learning technologies in Saudi higher education. *Frontiers in Psychology*, 13, 939336. https://doi.org/10.3389/fpsyg.2022.939336
2. Bentil, W., Liew, C. L., & Chawner, B. (2022). The management and the usage of electronic resources in academic libraries: A bi-directional relationship. *Journal of Librarianship and Information Science*. https://doi.org/10.1177/0266666920983600
3. Cantabella, M., Martínez-España, R., López, B., & Muñoz, A. (2021). A fine-grained model to assess learner-content and methodology satisfaction in distance education. *International Journal of Interactive Multimedia and Artificial Intelligence*, 6(4), 87–96. https://doi.org/10.9781/ijimai.2020.09.002

4. Chimah, J. N. (2024). Conceptualisation of open educational resources, audiovisual resources and electronic information resources: A literature-based study of selected academic libraries in Ebonyi State, Nigeria. Mousaion: *South African Journal of Information Studies*, 42(1). https://doi.org/10.25159/2663-659X/15078
5. Chouhan, S., Babu, M. S., & Patro, R. K. C. (2022). Web-OPAC utility among the users of select engineering colleges of Madhya Pradesh: An analytical study. Gyankosh: *The Journal of Library and Information Science*, 13(1&2), 32–45. https://doi.org/10.5958/2249-3182.2022.00004.1
6. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. https://doi.org/10.2307/249008
7. DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9–30. https://doi.org/10.1080/07421222.2003.11045748
8. Harish, H. T. (2023). Purpose of using e-ShodhSindhu by Indian Institute of Technology faculty: A study. *Journal of Interlibrary Loan, Document Delivery & Electronic Reserve*. 43(4), 334-343. https://doi.org/10.1080/0194262X.2023.2255995
9. Kok, C. Y., Puah, S. Y., Wang, P. C., & Chua, E-P. (2025). The mediating role of student engagement in the relationship between teacher and digital support and learner satisfaction in blended learning environments at higher education. *British Educational Research Journal*, 51, 1313–1341. https://doi.org/10.1002/berj.4123
10. Rajabalee, Y. B., & Santally, M. I. (2021). Learner satisfaction, engagement and performances in an online module: Implications for institutional e-learning policy. *Education and Information Technologies*, 26, 2623–2656. https://doi.org/10.1007/s10639-020-10375-1
11. Soroya, S. H., Ahmad, A. S., Ahmad, S., & Soroya, M. S. (2021). Mapping internet literacy skills of digital natives: A developing country perspective. *PLOS ONE*, 16(4), e0249495. https://doi.org/10.1371/journal.pone.0249495
12. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425–478. https://doi.org/10.2307/30036540
13. Wax, A., Deutsch, C., Lindner, C., Lindner, S. J., & Hopmeyer, A. (2022). Workplace loneliness: The benefits and detriments of working from home. *Frontiers in Public Health*, 10, 903975. https://doi.org/10.3389/fpubh.2022.903975
14. Zhou, L., Xue, S., & Li, R. (2022). Extending the technology acceptance model to explore students' intention to use an online education platform at a university in China. *SAGE Open*, 12(1). https://doi.org/10.1177/21582440221085259