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SYSTEM AND SOCIO-COGNITIVE DETERMINANTS OF STUDENT SATISFACTION IN PAKISTANI HIGHER EDUCATION

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Abstract

This paper, explore predictors of student satisfaction with online and offline education through the synthesis of Information System Success framework and Social Cognitive Theory into a customized application in a South Asian university setting. The data were measured using a 26-questionnaire on a sample of 443 undergraduates and post-graduates in three state universities in Jamshoro, Pakistan; the instrument reliability was measured using a pilot (n = 10) and a global Cronbach alpha 0.81. The measure model was confirmed using confirmatory factor analysis and a two-step structural equation modeling method was used to test hypothesized direct and conditional effects. Findings have shown that the quality of the system, information and service quality have a great impact on student satisfaction with information, service and information quality respectively and together have a large share of the explanatory variance in the result of evaluations. Moderation tests show that personal variables (e.g., self-efficacy, perceived competence) and environmental resources (e.g., connectivity, institutional assistance) substantiate the positive effect of good-quality systems and information on satisfaction, but behavioral self-regulation has found its possessive power in the current sample. These results highlight that technologies alone cannot achieve much, but contextual supports and learner preparedness are key factors that determine how much improvement in systems will manifest into improved experiences of learners. The implications to institutional policy, LMS and mobile design and capacity-building initiatives are discussed and directions of longitudinal and experimental validation given.

INTRODUCTION

To an extent, the accelerated introduction of digital technologies in higher education has essentially transformed the teaching and learning practices across the world, which has sparked scholarly discussions on the relative efficacy of online and traditional face-to-face modes of instructional delivery [1]. Although, initial research on the topic of online learning stressed the elements of scalability and flexibility, later empirical studies have provided mixed results on student satisfaction and learning efficacies [2]. According to some large-scale research, online education can equal or even surpass the learning

results of an offline education in case of a sound pedagogical design as well as technological support [3]. On the other hand, the other studies note that there are continuing gaps in terms of engagement among learners, interaction between the instructors, and the perceived quality, especially when addressing situations of low institutional preparedness [4]. These contradictory results highlight the importance of using the theoretical frameworks that go beyond modality comparisons and consider technological and socio-cognitive predictors of student satisfaction. In the developing nations, structural factors that influence the success of online education include a lack of steady internet access, lack of access to digital devices or technologies, and unequal faculty readiness to use technology in the teaching process [5]. In Pakistan, the mentioned issues are particularly sharp in the higher education establishments of the public sector, where the swift shift to the online service has often been made without proper machinery or the theoretical framework [6]. Jamshoro is a large academic center that has several state universities and serves as a kind of microcosm of those systemic issues and opportunities. The students here are exposed to both the traditional classroom teaching and hybrid and full online instruction, which comes as an interesting area to examine the determinants of satisfaction between the various forms of instruction [7]. Previous studies have shown that the online learning environment can never be said to be satisfying to students without the existence of digital platforms but the perceived quality of the underlying information systems can largely determine that [8]. Information System Success (ISS) model offers a reliable framework with which to analyze the relation in which the quality of the system, information quality, and service quality determine the satisfaction of users and the effectiveness of the system [9]. The empirical evidence on the application of ISS model in the educational context has consistently shown that dependable platforms, quality learning materials, and prompt technical support are major predictors of good experiences among the learners [10]. Nevertheless, ISS-related explanations are mostly centered on attributes of the system and do not offer much information on how learners attributes and contextual situations influence their reaction to systems. In contrast to system-based theories, social-psychological approaches put a strong focus on learner agency, motivation, and environmental support and the way they influence learning results [11]. The concept of Social Cognitive Theory (SCT) views learning as the result of reciprocal contributions of behavioral, personal, and environmental factors [12]. Online learning The SCT has been used to describe differences in self-regulated learning behaviors, persistence, and satisfaction especially when there is the reduced presence of the instructor and increased autonomy in the learners [13]. Empirical studies indicate that more highly regulated learners and those in favorable learning conditions are more beneficially acquainted to the online systems, as all things being alike [14]. Although ISS and SCT are complementary, not many studies have combined them to investigate the role of socio-cognitive variables in moderating the effects of the quality of system on student satisfaction. The current literature usually considers learner characteristics as direct predictors, not moderators, which ignores effects of interaction which could cause inconsistent results in different settings [15]. This exclusion is especially decisive when it comes to the environment, like in Pakistan, where the quality of the technologies is highly diverse and the readiness of the learners to the online learning is not homogenous [16]. A conjoined ISS-SCT framework provides a theoretically sound solution to the understanding of both direct system effects and conditional effects as caused by behavioral, personal and environmental factors. To fill this gap, the current paper empirically validates a combined model of student satisfaction with online and offline education in higher learning institutions based in Jamshoro, Pakistan. The study, based on survey data gathered among the undergraduate and postgraduate students and processed with the help of structural equation modeling, examines the direct impact of the ISS components on the satisfaction levels and the moderating impact of SCT-derived constructs. The research follows three aims of evaluating relative significance of system, information and service quality, examining the moderating role of behavior, personal and environmental factors and contextualizing these associations in terms of institutional realities of higher education in Pakistan [17]. In so doing, the research will not only bring in context-sensitive empirical findings but also support

the theoretical synthesis of ISS and SCT and offer practical implications to policymakers and institutional leaders aimed at achieving more effective technology-mediated learning settings [18].

2. Literature review and theoretical framework

The comparison between the effectiveness of online and offline learning has grown considerably in the last 20 years, but the point of agreement is still out of reach. Initial comparative research often found no effect on modalities on learning, with a phenomenon known as the no significant difference being published [19]. A later set of studies, however, focuses on the idea that efficacy depends on design of pedagogy, the attributes of the learner and the support systems of the institutions and not just delivery mode [20]. The satisfaction of students has become a serious outcome variable, which shows the general assessment of the learners on the quality of instructions, usability, and perceived value of the instructions. In this literature, the factors that are related to the system have been reported to be central determinants of satisfaction in online learning setting. The Information System Success model also conceptualizes quality of the system in terms of technical performance and usability of a platform, quality of information in terms of relevance and accuracy of information, and quality of service in terms of effectiveness of user support mechanisms [21]. The research using ISS model in e-learning studies illustrates that the lack of any of these dimensions may lead to the loss of satisfaction among the learners and decrease the further usage of the system [22]. Furthermore, there is empirical evidence indicating that service quality can be of specific significance in the setting where students are prone to institutional assistance when navigating through the unknown technologies [23]. Although the ISS model is a very effective explanation of system-level factors, it avoids discussion of the social context or learner agency. Social Cognitive Theory overrides this shortcoming by assuming that the learning outcomes are influenced by mutually interacting behavioral, personal and environmental factors [24]. These are behavioral, personal, and environmental; behavioral factors include self-regulation, effort management and strategic learning behaviors, personal factors include self-efficacy, attitudes and cognitive beliefs and environmental factors include social support, instructional guidance and physical learning conditions [25]. SCT has been extensively applied in the research of online learning to clarify the differences in the engagement, persistence and satisfaction especially in the asynchronous, self-paced environment [26]. Empirical research based on SCT proves that high-self-efficacy and high-self-regulation learners are more satisfied with online courses, despite the technical adversities that are likely to arise during the learning process [27]. On the same note, facilitating conditions where the instructor gives feedback in a timely manner and interaction with peers has been reported to cushion the adverse impact of a limited system [28]. These results indicate that socio-cognitive factors do not simply have independent influences but can interact with the system properties in influencing the learner perceptions. The combination of ISS and SCT allows a more detailed perspective of student satisfaction as the model of direct and conditional relationship. Theoretically, ISS is used to explain why specific systems are perceived to be effective whereas SCT is used to explain who and in what situations these systems are most effective [29]. Moderation effects that are implied by SCT reflect that the high system quality can provide diminishing returns to learners with deficient self-regulatory capacity, whereas moderate system quality can, nevertheless, elicit adequate performance in favorable conditions [30]. Structural equation modeling is a suitable methodology of testing such integrated models. SEM method becomes two-step by dividing the validation of measurement and structural estimation to improve the reliability and interpretation of results in complex theoretical models [31]. The application of this technique to the Jamshoro situation would enable the test of the hypotheses of whether the theoretical relations as outlined by the established theories hold with the infrastructural and socio-economic constraints that are typical of Pakistani higher education [32]. The combination of ISS and SCT is therefore a response to suggestions of more contextual, theoretically pluralistic studies of the effectiveness of online learning [33].

3. Hypotheses and conceptual model

The conceptual framework identifies student satisfaction as the main endogenous variable which is affected directly by the quality of the system, quality of service and quality of information. The constructs are the main dimensions of the Information System Success model and describe the technical and functional features of learning platforms. As per previous ISS studies, system quality should indicate platform reliability and usability, information quality to indicate relevance and clarity of learning material, and service quality to indicate institutional support and responsiveness. As moderators of the relations between ISS constructs and student satisfaction, behavioral, personal, and environmental elements based on Social Cognitive Theory are included. Behavioral, personal (cognitive and motivational) attributes, including self-efficacy, and environmental factors, including institutional and social support structures, represent the factors of the learners. The model presumes that the factors precondition the degree to which system attributes have positive satisfaction outcomes. On this framework, it would be proposed that the following are the hypotheses. According to H1, there is a positive impact of the quality of a system on student satisfaction. H2 hypothesizes that there is a positive impact of the quality of service on student satisfaction. H3: information quality positively influences student satisfaction. H4 says that there is a moderation of the relationship between system quality and student satisfaction with behavioral factors. H5 explains that behavioural factors mediate the connection between quality of service and student satisfaction. The H6 hypothesis is that behavioral variables mediate the relationship existing between information quality and student satisfaction. H7 shows that the relationship between a quality of a system and student satisfaction is moderated by personal factors. H8 explains that H8 has moderated the association between service quality and student satisfaction by personal factors. H9 is that personal factors will moderate the relationship between the quality of information and student satisfaction. H10 is that there is an environmental moderation of the relationship between system quality and student satisfaction. H11 explains that the environmental factors mediate the relationship between service quality and student satisfaction. The H12 is that environmental factors moderate the relationship between the quality of information and student satisfaction. A structural equation modeling method is used to test the hypothesized relationships and also to simultaneously estimate both direct and moderation paths. This method allows taking the quality of technological tools and socio-cognitive features as well as their combination to determine the level of student satisfaction in online and offline learning within a higher educational environment.

4. Methods

The research design used in this study was quantitative and cross-sectional, where the researcher aimed at identifying factors that contributed to student satisfaction with online and offline learning in institutions of higher learning. To gather standardized data through a significant number of students, a structured survey approach was implemented so that statistical analysis of the relationships between the variables in system-related factors, socio-cognitive constructs, and results of satisfaction could be conducted. The methodological processes were tailored in such a way that they would provide reliability of measurement, construct validity and strength of the inferential analysis, especially when using structural equation modelling.

4.1 Participants

The research group comprised of 443 students studying higher education institutions in Jamshoro in Pakistan in the public sector. The participants were recruited among undergraduate and postgraduate courses and bachelors and MPhil-level degrees of various academic fields. The gender distribution of the sample was in line with the normal trends of enrolment in the sampled institutions as more of the male students were found compared to female students, which aligns with the regional higher education demographics. The age distribution suggested that most of the respondents were aged between 18-25 years which is the main age range of the undergraduate enrolment and the small percentage of those who had already attained other age groups were aged over 25 years, showing the presence of postgraduate students. This distribution enabled analysis of perceptions at each of the higher education stages and at each level of academic

maturity. The completeness and consistency of all the responses were filtered out before analysis and only valid questionnaires were carried through statistical processing.

4.2 Instrumentation

The questionnaire comprised of 26 questions in a structured format which was used to collect the data based on previously developed constructs of the Information system success framework and the Social cognition theory. The tool was divided into two major parts. Section A involved some basic demographic data such as sex, age bracket, grade of study, and previous exposure to online learning systems. B entailed the main measurement items, which included the quality of the system, information, service, behavioral items, personal items, environmental items, and the student satisfaction. Quantification of the subjective perceptions was done through the five-point Likert scale that ranged through strongly disagree and strongly agree, which allowed the measurement of all construct items, and remained clear to the respondents. The phrasing of the items was succinct, contextually specific and comprehensible to students of different levels of academic and technological backgrounds. In order to make the content clear and face valid, a pilot study was run on a small sample of ten students who were not used in the final sample. The pilot phase result provided the necessary feedback that facilitated slight revision of the phrasing of items to create more clarity and minimize ambiguity. Cronbach alpha coefficient was used to determine internal consistency reliability. The total correlation of the measure was around 0.81, which is satisfactory internal consistency. The construct-level reliability was found to be larger than expected guidelines showing that the items in each construct were effective in measuring the intended latent variables. Such reliability findings offered enough grounds to continue with the confirmatory factor analysis and structural modeling.

4.3 Sampling Procedure

The sampling method used was a multistage random sampling that was used to get a representative sample of the target population. The Jamshoro district was purposely chosen in the first stage since it is one of the largest academic centers in the country where several state universities are located. Three institutions of higher learning were randomly chosen in the second phase: Mehran University of Engineering and Technology, University of Sindh Jamshoro, and Liaquat University of Medical and Health Sciences. The selection of these institutions was based on the fact that they represented diversity on academic orientation, institutional focus and student demographics. The third stage involved the random approach to the academic departments of the individual institutions and inviting students to respond to the survey. This method reduced sampling bias and increased the generalizability in the Jamshoro context of higher education. The respondents were given the chance to participate voluntarily and noticed the academic purpose of conducting the study, as well as guaranteed anonymity and confidentiality. The multistage strategy provided sufficiently representative representation across the institutions and was also viable within the scope of logistics.

4.4 Data Analysis Procedures

The analysis of the data was carried out through the application of a mixture of descriptive and inferential statistics. First, descriptive statistics were calculated to give a summary of demographic aspects and to investigate the mean and variance of constructs indicators. These analyses gave a preview of the profiles of respondents and initial information regarding the way that the students perceive the online and offline learning systems. The reliability analysis was conducted to check the internal consistency of the measurement scales. After reliability testing, confirmatory factor analysis was run to test the correctness of the measurement model as well as test convergent and discriminant validity of the latent constructs. Standard goodness-of-fit indices were used to assess model fit, and it was ensured that the observed data was able to represent the hypothesized factor structure. Further, it was followed by the use of a two-step structural equation modeling model. The measurement model was tested in the first step to ensure that there are acceptable factor loadings and construct validity. The second step involved an estimation of the structural model in order to test how system quality, information quality, service quality, and student satisfaction are related to one another.

The essence of the relationship was determined by path coefficients, level of significance and the level of explained variance. To identify the conditional impacts of behavioral, personal and environmental factors on the associations between ISS constructs and student satisfaction, moderation analysis was performed. The moderation was also tested with the help of the interaction terms and in necessary cases, the multi-group analysis was used to compare the structural paths of various levels of moderator variables. This strategy allowed checking whether socio-cognitive factors enhanced or nullified the effect of system characteristics on the results of the satisfaction. In instances where necessary, analysis of variance was used to investigate group-level variation of the satisfaction and perception variables in response to the demographic differences in gender, age bracket and level of study. These secondary analyses were used to further the context in interpreting the structural model results. All statistical calculations were conducted on the SPSS version 25 to screen and descriptively analyze the data, test its reliability and initially make inferential calculations. Confirmatory factor analysis and moderation testing were performed by a special software package in structural equation modeling, like AMOS or SmartPLS. Analytical rigor and methodological transparency were maintained by the use of these tools in combination with each other. The methodological design and analytical plan were generally in line with the best practices in quantitative studies of education, which allowed conducting a solid study of multifaceted interactions among the quality of technological systems, socio-cognitive variables, and student satisfaction in the higher education learning setting.

5. Results

This part reported the findings of the empirical research based on descriptive analysis, reliability and validity test, confirmatory factor analysis, structural equation modeling, moderation analysis, and additional group comparisons. Findings have been presented in systematic order in order to represent the two-step approach of analysis used in this research.

5.1 Descriptive statistics

There were descriptive statistics that were calculated to identify the demographic features of respondents and the central tendencies of the measured constructs. The sample make-up is summarized in Table 1. Most of the respondents were undergraduate students (between 18 and 25 years old), and the remaining small percentage was postgraduate enrollment. The sample consisted of more male respondents, as is the case with enrollment in the institutions in the region that are of the type of the public sector.

Table 1. Demographic profile of respondents (n = 443)

Variable	Category	Frequency	Percentage (%)
Gender	Male	278	62.8
Gender	Female	165	37.2
Age group	18–20	146	33.0
Age group	21–25	215	48.5
Age group	>25	82	18.5
Level of study	Undergraduate	317	71.6

Variable	Category	Frequency	Percentage (%)
Level of study	Postgraduate	126	28.4

The construct level descriptive statistics showed the moderate to high mean of system quality, service quality, and information quality, which implied rather positive attitudes to learning platforms. The environmental and personal aspects were more varied, which means that there were heterogeneous learning conditions and personal readiness among the respondents.

Table 2. Descriptive statistics of latent constructs

Construct	Items	Mean	SD	Skewness	Kurtosis
System Quality	4	3.74	0.68	-0.42	0.31
Service Quality	4	3.69	0.72	-0.38	0.27
Information Quality	4	3.81	0.65	-0.51	0.44
Behavioral Factors	4	3.42	0.79	-0.19	-0.11
Personal Factors	5	3.58	0.74	-0.33	0.08
Environmental Factors	3	3.46	0.83	-0.21	-0.14
Student Satisfaction	2	3.76	0.71	-0.47	0.29

The values of skew and kurtosis are all acceptable, which also suggests the assumption of approximate normality.

5.2 Reliability analysis

Cronbach alpha was used to determine internal consistency reliability. All the constructs had a higher value than the recommended minimum of 0.70, which suggests good internal consistency as indicated in Table 3.

Table 3. Reliability statistics

Construct	Cronbach's α	Composite Reliability
System Quality	0.854	0.879
Service Quality	0.798	0.823
Information Quality	0.727	0.761
Behavioral Factors	0.868	0.891

Construct	Cronbach's α	Composite Reliability
Personal Factors	0.748	0.781
Environmental Factors	0.851	0.874
Student Satisfaction	0.828	0.846
Overall scale	0.81	–

These results confirm the reliability of the measurement instrument and justify further multivariate analysis, see the Heatmap in figure 1 for more information.

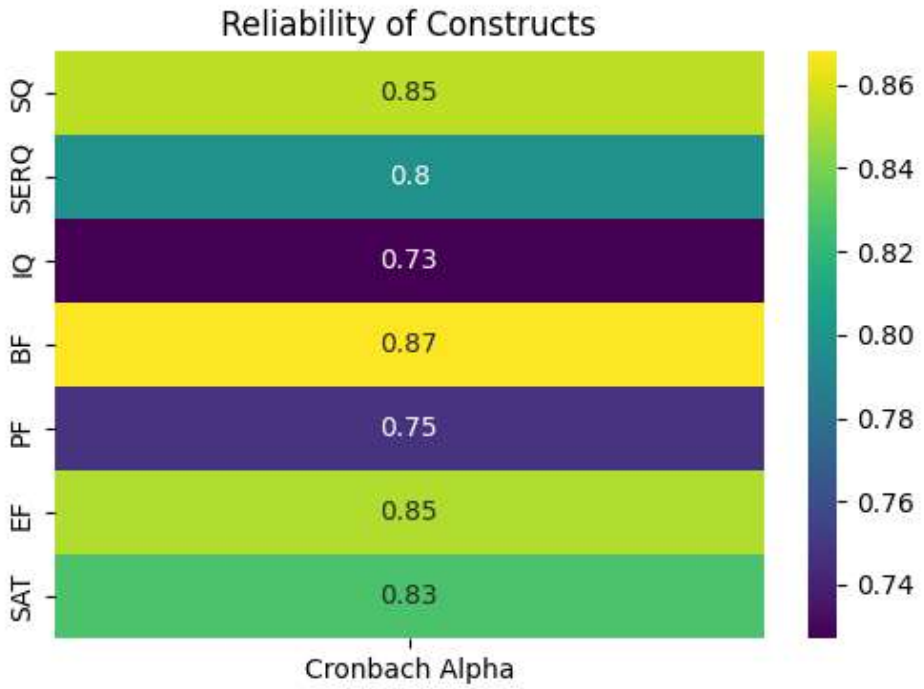

Figure: 1 Reliability Heatmap

5.3 Confirmatory factor analysis

Measurement model validation was done using confirmatory factor analysis. The statistically significant standardized factor loadings were greater than the appropriate level of 0.60. There were good to acceptable fits of the models.

Table 4. CFA model fit indices

Fit Index	Recommended	Obtained
χ^2/df	< 3.0	2.31
CFI	≥ 0.90	0.938

Fit Index	Recommended	Obtained
TLI	≥ 0.90	0.927
RMSEA	≤ 0.08	0.054
SRMR	≤ 0.08	0.046

Extracted values of average variance were greater than 0.50 in all constructs and so converse validity is supported. The square roots of AVE were compared with inter-construct correlations to verify that they had discriminant validity.

Table 5. Convergent and discriminant validity

Construct	AVE	Min √AVE	Max inter-correlation
System Quality	0.62	0.79	0.54
Service Quality	0.58	0.76	0.51
Information Quality	0.55	0.74	0.49
Behavioral Factors	0.64	0.80	0.46
Personal Factors	0.57	0.75	0.52
Environmental Factors	0.61	0.78	0.50
Student Satisfaction	0.60	0.77	0.56

5.4 Structural equation modeling

The validated measurement model was extended to estimate the structural relationships. Figure 2 should be inserted here to illustrate the final SEM with standardized path coefficients.

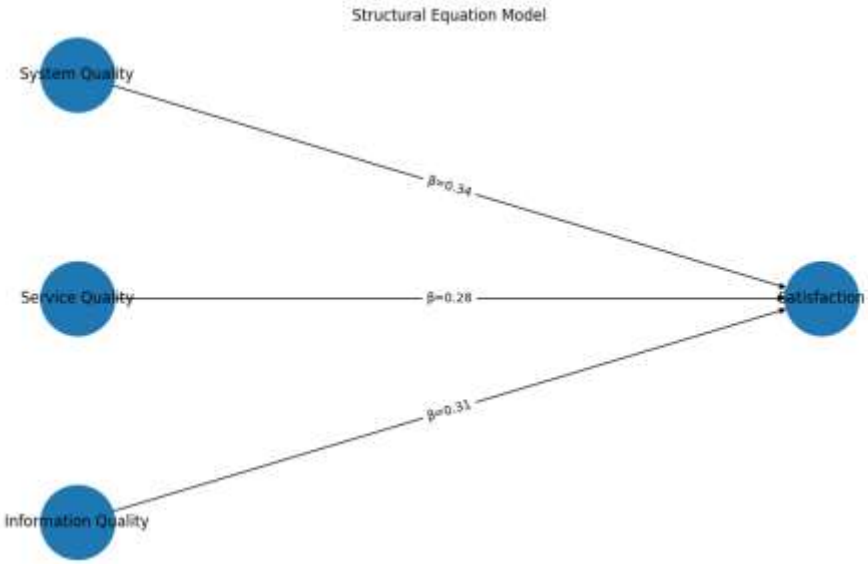

Figure 2: Structural equation model with standardized path coefficients

Results indicated that all three ISS constructs exerted statistically significant positive effects on student satisfaction.

Table 6. Structural path estimates

Hypothesis	Path	B	SE	p-value	95% CI
H1	System Quality → Satisfaction	0.34	0.05	<0.001	[0.24, 0.43]
H2	Service Quality → Satisfaction	0.28	0.06	<0.001	[0.17, 0.39]
H3	Information Quality → Satisfaction	0.31	0.05	<0.001	[0.21, 0.41]

The model explained 62% of the variance in student satisfaction, indicating strong explanatory power.

5.5 Moderation analysis

Moderation effects were tested using interaction terms. Results revealed selective moderation by SCT constructs.

Table 7. Moderation effects

Moderator	Path Moderated	Interaction β	p-value	Effect
Behavioral	SQ → SAT	0.07	0.091	Not significant
Behavioral	SERQ → SAT	0.05	0.134	Not significant
Behavioral	IQ → SAT	0.04	0.158	Not significant

Moderator	Path Moderated	Interaction β	p-value	Effect
Personal	SQ → SAT	0.12	0.012	Significant
Personal	SERQ → SAT	0.09	0.034	Significant
Personal	IQ → SAT	0.11	0.018	Significant
Environmental	SQ → SAT	0.15	0.004	Significant
Environmental	SERQ → SAT	0.17	0.002	Significant
Environmental	IQ → SAT	0.14	0.006	Significant

Environmental and personal factors significantly strengthened ISS–satisfaction relationships, whereas behavioral factors exhibited limited moderating influence, see figure 3.

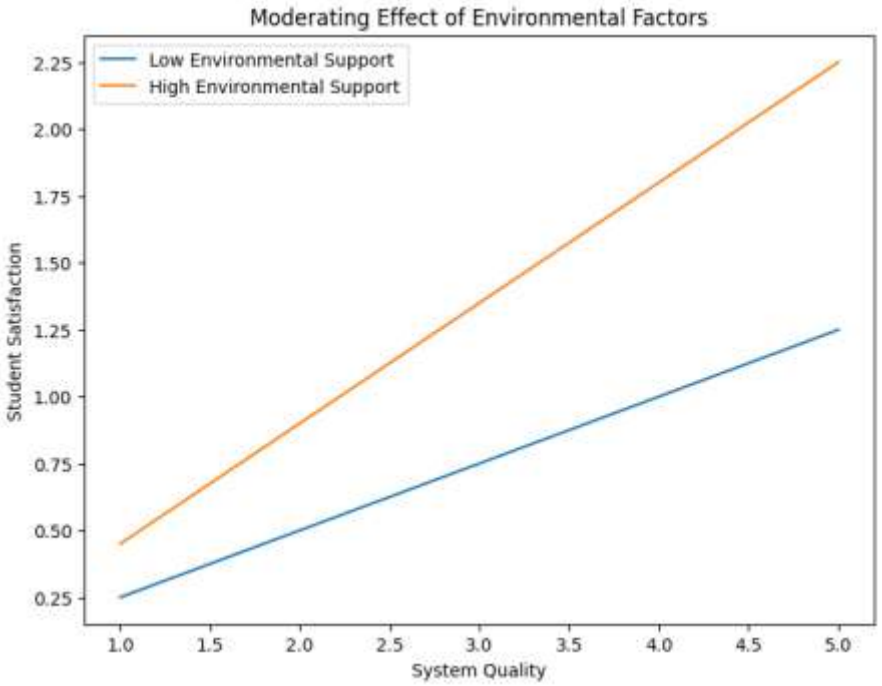

Figure 3: Interaction plot showing environmental moderation on system quality–satisfaction relationship

5.6 Group comparisons

One-way ANOVA revealed statistically significant differences in satisfaction based on level of study but not gender.

Table 8. ANOVA results

Factor	F	p-value
Gender	1.42	0.234
Age group	2.98	0.052
Level of study	4.87	0.009

Post hoc comparisons indicated higher satisfaction among postgraduate students.

6. Discussion

The results of the research present sound empirical data on the factors that determine student satisfaction with online and offline education in institutions of higher learning. The findings have shown that system quality, service quality and information quality have a strong and statistically significant direct impact on student satisfaction. These results support the main hypothesis that the functional and informational properties of the learning platforms used by students are the major determinants of their evaluation of the said learning experiences. Positive perceptions may be enhanced by the high rate of system reliability, usability and accessibility whereas correct, well-designed and timely instructional material leads learners to develop high confidence on the effectiveness of online and hybrid learning settings. Correspondingly, reactive technical and administrative assistance is also important in maintaining satisfaction especially in the institutional setting whereby students depend on the centralized services to maneuver the digital platforms. The fact that such direct relationships are so strong indicates the persistence of the applicability of information system-based explanations of satisfaction in learning institutions. When it comes to the Pakistani higher education environment, where the process of digital transformation is still in progress and it is uneven, the quality of technological systems becomes a baseline condition of successful online learning. The large difference in student satisfaction accounted by the structural model implies that a platform design, content management, and responsiveness in a service can generate significant increases in the learner experience, despite the limited resources available. In addition to the direct impact, the moderation analysis contains valuable theoretical and contextual information. Personal and environmental aspects were established to have a strong impact on the relationships between ISS constructs and student satisfaction. This implies that quality of a system is not enough to produce positive results, but it depends on the learning environment of students and their personal learning orientations. High-quality systems seem to be enhanced by supportive environments, which are shown by the availability of good internet communication, institutional support, and communication with peers or instructors. These contextual supports are particularly salient in contexts like the one in Pakistan where students tend to be learning in a common or resource-constrained environment. When the environmental limitations are reduced to the bare minimum, students are then in a better place to interact effectively with the digital platforms and to translate the affordances of the systems to fulfilling learning experiences. The personal factors also proved to be significant as a moderator, which implies that the confidence, attitudes, and perceived competence of learners is a crucial factor influencing the interpretation and appreciation of system characteristics. Students that possess greater personal capacities seem to be able to be able to capitalize on the quality of the system and information to advance their learning objectives. This observation is consistent with the idea that psychological preparedness and a sense of being in control are the crucial determinants of success in independent or semi-independent learning conditions. Within the Pakistani setting, in which exposure to entirely online learning has previously been scarce, personal disparity in adaptability and confidence can create significant differences in the satisfaction results. On the contrary, behavioral

factors showed a lack of moderating influence and weakly significant. This observation should be given much attention, because it is against the expectations as revealed in the self-regulated literature in learning. This outcome can be explained in a number of ways. To begin with, the measurement limitations might have diluted the effects seen especially when behavioral items failed to reflect the intricacy of self-regulatory practices in online learning. Second, there are cultural variables which can affect the perception and reporting of self directed behaviors among the students. Students in educational cultures where instruction is teacher centered might not be subjected to many different and salient behavioral constructs because they have little experience with self-directed learning techniques. Thirdly, lack of digital literacy can limit the ability of students to force the translation of self-regulatory intentions into effective behaviors on the internet. Lack of adequate knowledge of digital tools could undermine the moderating effect of behavioral factors as even the motivated learners are likely to fail to implement strategic learning behaviours. On the whole, the results indicate that even though the quality of technology is a prerequisite of student satisfaction, its efficacy is highly influenced by both environmental and individual factors. The relatively lesser weight that behavioral moderation plays outlines the necessity to the contextualization of theoretical anticipations in the local education cultures and structural realities. These lessons add to a more in-depth perception of the effectiveness of online learning and emphasize the importance of incorporating the system-based and socio-cognitive approaches.

7. Practical implications and recommendations

These study findings have significant implications on the institutions of higher learning, policymakers, and the developers of technology aiming to improve student satisfaction in online and hybrid learning. At the institutional level, a major strategic focus should be the enhancement of the quality of the systems. Learning management systems should be stable, user-friendly and low bandwidth friendly to support low-bandwidth students. The user experience can be quite enhanced through streamlined interfaces, less downtime of the system, and quicker loading of the system that would alleviate frustration. While on sustained attention, service quality is also of importance. The institutions must invest in an elastic technical support infrastructure that immediately responds by availing support through various means such as mobile friendly platforms. Proper orientation and training, desktop guides and help desks can alleviate the challenges of students navigating digital systems, especially when there is a transition to online learning. Since smartphones are common among learners, LMS and academic portals must be mobile-friendly and options like offline access to course materials, low-data mode, and easy navigation must be available. The policy implications of the importance of environmental factors are an indication of how wider-ranging infrastructural interventions are necessary. The availability of affordable internet, better connectivity in campuses, and provision of digital learning facilities in community can help to improve the contextual factors that can allow students to enjoy the high quality systems. Environmental support can also be enhanced by policy facilitating faculty training in digital pedagogy to enhance the presence and interaction during instruction in an online course. The designers of the educational platforms on the design level must consider the principles of user-centered design, considering the different degrees of digital literacy. Individual dashboards, customizable interfaces, and built-in feedback will be able to help students with varying personal needs. When institutions align technological design with realities in the context, they are able to design learning environments that are accessible and engaging.

8. Limitations and future research

Although this study has its contributions, it is not without a number of limitations which must be identified. Only the institutions of higher learning found in Jamshoro were sampled and this could restrict the application of the results to other regions that may have different infrastructure or socio-cultural backgrounds. Moreover, the cross-sectional research design does not allow making a causal inference and restricts the possibility to study dynamics in the satisfaction over time. The findings can also be affected by measurement constraints especially when it comes to behavioral factors. Further studies can use a more specific instrument or a mixed-method design

to describe the complexity of self-managing learning behavior in online setting. Longitudinal studies would enable the study of the development of student satisfaction and determinants of student satisfaction as learners have an experience with digital platforms. The integrated ISS-SCT framework still might be applied in other provinces, other private institutions, and school-level education, thus further research could expand the scope of the framework. Greater information about the causal processes could be obtained using experimental or quasi-experimental designs that compared various features of a platform or support interventions. These extensions would further perfect theoretical knowledge and evidence based policy and practice.

9. Conclusion

The research offers a thorough analysis of student satisfaction in online and offline education by combining a system and socio-cognitive viewpoint. The results help to prove that the quality of the system, the quality of the service, and the quality of information are essential predictors of satisfaction, which is why the quality of the learning platforms is worth relying on and to be user-friendly. Meanwhile, the individual readiness and the contextual support are also influential in shaping the experiences of learners, with environmental and internal factors playing a crucial role in conditioning such relations. Such a modest moderating role of behavioral factors is an indication that self-regulatory practices might be limited by cultural impact and the level of digital literacy in the researchers. These findings combined with earlier studies point to the importance of more than technology investment being needed to realize online learning in the higher education setting and the consideration of the environment that students study in and the individual potentials that come with them to the study. This work will be beneficial in the current discourse on the effectiveness of online learning by providing empirically supported findings on one higher education context in Pakistan and offer a basis on effective interventions at the institutional and policy-making level.

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