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User-Perceived Non-Functional Quality of a Student Information System: A Case Study at Sebha University

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إدراك المستخدم للمتطلبات غير الوظيفية في تقييم نظم معلومات الطلاب: دراسة حالة في جامعة سبها

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Abstract:
This study evaluated students' perceptions of key non-functional requirements (NFRs) of the Student Information System (SIS) used at the Faculty of Information Technology, Sebha University. The assessment focused on four dimensions: reliability, efficiency, security, and usability. Data were collected using a structured questionnaire administered to SIS users, and the student responses were analyzed to identify perceived strengths, weaknesses, and preferences between the two system versions. Among students, security received the highest weighted score (66.9%), followed by efficiency (64.0%), usability (62.8%), and reliability (59.4%). Although all four dimensions were evaluated at a moderate level, reliability represented the weakest dimension, particularly with respect to the accuracy and clarity of academic reports, duplicated information, data recovery, information exchange, interface-icon organization, and user guidance. Version 2 was preferred by 85.5% of students, whereas 14.5% preferred Version 3. This preference highlights the need for a more detailed user-centered evaluation of the changes introduced in the newer version. Overall, the findings indicate that the SIS has relative strengths in perceived security and efficiency but requires improvement in reliability, academic-report quality, data recovery, information exchange, interface consistency, and user guidance. The study provides practical recommendations for future SIS development and demonstrates the value of evaluating NFRs through user perceptions, while emphasizing the need to complement questionnaire findings with objective technical, security, and task-based usability assessments.

Keywords: Efficiency, Evaluation, Reliability, Sebha University, Security, Student Information Systems, User Interface Design

الملخص

قامت هذه الدراسة بتقييم تصورات الطلاب حول المتطلبات غير الوظيفية الرئيسية (NFRs) لنظام معلومات الطلاب (SIS) المستخدم في كلية تكنولوجيا المعلومات بجامعة سبها. ركز التقييم على أربعة أبعاد: الموثوقية والكفاءة والأمن وسهولة الاستخدام. تم جمع البيانات باستخدام استبيان منظم موجه لمستخدمي SIS، وتم تحليل استجابات الطلاب لتحديد نقاط القوة والضعف والتفضيلات بين إصداري النظام. من بين الطلاب، حصل الأمن على أعلى الدرجات المرجحة (66.9%)، تليها الكفاءة (64.0%)، وسهولة الاستخدام (62.8%)، والموثوقية (59.4%). وعلى الرغم من أن الأبعاد الأربعة تم تقييمها بمستوى متوسط، إلا أن الموثوقية تمثل البعد الأضعف، خاصة فيما يتعلق بدقة ووضوح التقارير الأكاديمية، والمعلومات المكررة، واستعادة البيانات، وتبادل المعلومات، وتنظيم الواجهة والأيقونات، وتوجيه المستخدم. تم تفضيل الإصدار 2 من قبل 85.5% من الطلاب، بينما فضل 14.5% الإصدار 3. يسلط هذا التفضيل الضوء على الحاجة إلى تقييم أكثر تفصيلاً يتمحور حول المستخدم للتغييرات التي تم إدخالها في الإصدار الأحدث. بشكل عام، تشير النتائج إلى أن نظام SIS يتمتع بنقاط قوة نسبية في الأمن والكفاءة المدركة ولكنه يتطلب تحسينًا في الموثوقية وجودة التقرير الأكاديمي واستعادة البيانات وتبادل المعلومات واتساق الواجهة وتوجيه المستخدم. تقدم الدراسة توصيات عملية لتطوير SIS في المستقبل وتوضح قيمة تقييم NFRs من خلال تصورات المستخدم، مع التأكيد على الحاجة إلى استكمال نتائج الاستبيان بتقييمات موضوعية فنية وأمنية وقابلية الاستخدام على أساس المهام.

الكلمات الدالة: : الأمان ، التقييم ، الكفاءة ، الموثوقية ، تصميم واجهات المستخدم ، جامعة سبها ، نظم معلومات الطلاب

1- Introduction

Educational institutions globally depend on robust management systems to administer student data, optimize administrative workflows, and enhance academic operations. Central to the digital infrastructure of many universities is the Student Information System (SIS), a foundational platform that consolidates student-related data and administrative functions [1]. The SIS is instrumental in facilitating essential academic activities, including grade retrieval, course enrolment, and the dissemination of institutional communications across the campus community.

In systems engineering, while functional requirements define the specific behaviors and tasks a system must execute, non-functional requirements (NFRs) dictate the qualitative attributes of its operational performance [2]. These NFRs encompass critical dimensions such as performance, reliability, security, usability, and scalability, all of which are imperative for the optimal functioning of any information system [27,31].

Nevertheless, evaluating SIS efficacy against NFRs introduces significant challenges. These include implementation complexities, resource-intensive testing protocols, and inherent trade-offs between functional and non-functional objectives [12, 37]. Furthermore, institutions in developing nations encounter compounded barriers to SIS implementation and NFR evaluation, notably constrained technological infrastructure, fiscal limitations, and a deficit in specialized technical expertise [16, 23].

This study aims to investigate the efficacy of evaluating a Student Information System (SIS) against non-functional requirements (NFRs) within a public university context [17]. Specifically, the research focuses on four critical NFR dimensions: reliability, efficiency, security, and user interface design. The target population comprises students and academic staff at the Faculty of Information Technology, Sebha University. To capture empirical perspectives from these key stakeholders, the study employs a structured questionnaire distributed to both student and instructor cohorts.

The systematic integration of these specific NFRs into SIS development is fundamental to delivering an optimized user experience, maximizing operational productivity, and ensuring system dependability. An intuitive user interface directly enhances user satisfaction and task efficiency, while stringent efficiency requirements ensure optimal system responsiveness. Furthermore, robust reliability measures mitigate system downtime, thereby fostering user trust, and comprehensive security protocols safeguard sensitive institutional data to ensure regulatory compliance and risk mitigation. Ultimately, the synergistic implementation of these non-functional attributes drives overall stakeholder satisfaction, supports system scalability, and guarantees the long-term viability of the SIS.

Based on the empirical findings, this paper offers critical insights into the challenges, best practices, and potential solutions for evaluating a Student Information System (SIS) against non-functional requirements (NFRs), with a specific focus on reliability, efficiency, security, and usability. To guide this investigation, the study addresses the following research questions:

> Q1: How do students perceive the reliability, efficiency, security, and usability of the current Student Information System?
>
> Q2: Which questionnaire items represent the strongest and weakest aspects of the system within each non-functional quality dimension?
>
> Q3: Which system version do participate students prefer, and what proportion prefers version 2 compared with version 3?
>
> Q4: What practical improvements can be derived from the identified weaknesses?

The remainder of the paper is organized as follows. Section 2 reviews the literature on Student Information Systems, non-functional requirements, and user-based system evaluation. Section 3 describes the research design, sample, questionnaire, validity and reliability procedures, and data-analysis methods. Section 4 presents and discusses the findings. Section 5 outlines the study's limitations, and Section 6 provides the conclusion and recommendations**.**

2- Literature review

Information systems (IS) are integral to modern organizational infrastructure, driving efficiency, productivity, and informed decision-making. However, their implementation across diverse sectors presents distinct challenges. In the healthcare domain, for instance, professionals often exhibit resistance to IS adoption due to perceived workflow disruptions and inequities, necessitating targeted change management strategies [34]. Furthermore, interoperability issues between IS and legacy systems frequently impede the delivery of comprehensive care. Similarly, the transition to IS-driven paradigms in other fields reveals complex trade-offs. In higher education, the efficacy of blended learning models remains widely debated; while hybrid approaches yield marginal improvements in certain metrics, traditional methodologies may outperform them in others, with overall retention rates remaining comparable [11,22]. The recent shift to remote learning has further exposed vulnerabilities regarding tool integration, technological equity, and academic integrity, highlighting the need for robust training, community building, and blended pedagogical strategies [35]. In the realm of cybersecurity, transitioning to specialized IS roles demands rigorous upskilling and continuous learning. Even when electronic document management systems are adopted to enhance security and efficiency, the initial implementation can be highly labor-intensive, underscoring the necessity of strategic planning [29].

Within university settings, the success of IS is contingent upon several critical factors, including instructor proficiency, technological infrastructure, and institutional support. Instructors' technological adaptability and their ability to integrate digital tools effectively are paramount for system success [24]. Concurrently, well-designed, intuitive interfaces are essential for fostering student engagement and satisfaction. Institutional backing, encompassing supportive policies and adequate resource allocation, ultimately dictates the efficacy of these systems in enhancing student learning outcomes [8]. Consequently, extensive research has focused on evaluating user satisfaction and usability within academic IT environments. [36] demonstrated that system usability and ease of use are primary determinants of user satisfaction in academic IS. Complementing this, a specialized instrument was developed for measuring e-learning satisfaction, identifying system usability as a critical indicator [14]. Other studies have highlighted the influence of interface aesthetics on user satisfaction in web-based IS [7], and utilized frameworks such as the end-user computing satisfaction model and the IT balanced scorecard to evaluate IS performance in corporate settings [30]. The broader impact of Information Systems (IS) evaluation on educational ecosystems is multifaceted. A critical emphasis has been placed on assessing IT integration within higher education environments to ensure its alignment with pedagogical goals [15]. Expanding on this, a comprehensive evaluation model for e-learning success was proposed to incorporate the diverse perspectives of all stakeholders [9]. Furthermore, the evaluation of IS in education extends to curriculum design and administrative tracking. On one hand, IS education must continuously adapt to dynamic market demands to adequately prepare students for their careers [32]. On the other hand, research highlights the administrative value of longitudinal student data systems in providing actionable insights for educators and policymakers [10]. However, despite this extensive body of research examining academic information-system usability and user satisfaction globally, limited published evidence is available on the perceived non-functional quality of Student Information Systems (SIS) within the Libyan higher education context. In particular, the relative strengths and weaknesses of key non-functional attributes—namely reliability, efficiency, security, and usability—in the Sebha University SIS have not been documented systematically. The present study addresses this contextual and empirical gap through a questionnaire-based evaluation at the Faculty of Information Technology. Its contribution is diagnostic and localized: it identifies user-perceived priorities for system improvement rather than conducting direct technical testing of system performance or security.

A significant component of Information Systems (IS) evaluation involves the specification and assessment of Non-Functional Requirements (NFRs). To manage the complexity of NFRs, several taxonomies have been proposed in the literature. In particular, a taxonomy tailored for service-oriented architectures was introduced, categorizing NFRs into process, non-functional external, and non-functional service requirements [3]. This framework was subsequently refined by identifying four distinct NFR types: Functionally Restrictive, Additive Restrictive, Policy Restrictive, and Architecture Restrictive [5]. Building upon these concepts, a comprehensive taxonomy was developed to assist requirements analysts in classifying NFRs effectively [18]. Additionally, a formal, model-based approach utilizing structured logic programming was proposed to specify and compose interacting NFRs [6]. The empirical impact of Non-Functional Requirements (NFRs) on software project success is well-documented. It has been observed that the frequent neglect of NFRs leads to diminished product success and inflated development costs [4]. Conversely, a positive correlation has been established between a strong focus on NFRs and the overall maturity of the requirements engineering process [25]. To mitigate late-stage defects, early integration of NFRs at the business process level has been advocated, which significantly reduces rework and ensures better alignment between business objectives and IS capabilities [33]. Despite their critical importance, the implementation and testing of NFRs present substantial challenges. In particular, the necessity of prioritizing NFRs has been emphasized even within rapid agile development cycles [13]. Furthermore, research has analyzed the accuracy of various NFR prioritization techniques while accounting for software complexity [19], and methodologies have been established to identify NFRs based on a deep understanding of stakeholder needs [28].

In conclusion, while the implementation and evaluation of IS offer transformative potential across sectors, realizing these benefits requires overcoming significant implementation barriers, user resistance, and contextual constraints. The literature underscores the imperative of developing robust strategies to enhance system usability, manage stakeholder expectations, and rigorously prioritize NFRs in specific operational environments. Addressing these challenges—particularly within developing higher education contexts like Libya—is essential not only for the technical success of IS projects, but also for maximizing their long-term impact on organizational efficiency and academic effectiveness.

3. Methodology

3.1 Research Design

The study employed a quantitative, cross-sectional survey design to evaluate users' perceptions of the non-functional quality of the Student Information System (SIS). Data were collected once during 2022 using a structured questionnaire administered to students and teaching staff. The design and reporting structure were aligned with the principles of the Strengthening the Reporting of Observational Studies in Epidemiology statement for cross-sectional studies von Elm et al [46]. Although the instrument contained optional open-ended prompts, the present analysis focused on the structured quantitative responses; the study is therefore reported as a quantitative survey rather than a mixed-method investigation.

The evaluation focused on reliability, efficiency, security, and usability. For contemporary conceptual alignment, these study-specific perceived-quality constructs were mapped to the current Square framework. ISO/IEC 25010:2023 defines a product-quality model for ICT and software products, while ISO/IEC 25019:2023 defines a quality-in-use model for systems used in a specified context (International Organization for Standardization [ISO] & International Electrotechnical Commission [IEC], 2023a, 2023b). Because data collection occurred in 2022, the 2023 editions are used here as a current reporting framework and are not claimed to have guided the original questionnaire development. The instrument was not a complete operationalization of either standard.

3.2 Study Setting and Population

The study was conducted at the Faculty of Information Technology, Sebha University, Libya. The target population comprised undergraduate students and teaching staff who used the SIS within the Networks, Information Systems, and Computer Science departments. These groups were selected because they interact with the system for related but distinct academic and administrative purposes.

3.3 Sampling and Analytical Sample

Questionnaires were distributed to available SIS users in the three departments. A total of 155 questionnaires were distributed: 134 to students and 21 to teaching staff. Of these, 130 were valid for analysis, yielding an overall response rate of 83.9%. The analytical sample comprised 110 students and 20 teaching staff members. Incomplete or otherwise invalid questionnaires were excluded before analysis.

Table 1. Distribution and response rates of the study sample

Participant group	Distributed	Valid	Response rate	Analytical sample
Students	134	110	82.1%	84.6%
Teaching staff	21	20	95.2%	15.4%
Total	155	130	83.9%	100.0%

The student questionnaires were distributed across the Networks, Information Systems, and Computer Science departments as shown in Table 2. Department-specific counts of valid returned questionnaires were not available; consequently, departmental comparisons were not performed.

Table 2. Distribution of student questionnaires by department

Department	Questionnaires distributed	Percentage of student questionnaires
Networks	38	28.4%
Information Systems	59	44.0%
Computer Science	37	27.6%
Total	134	100.0%

3.4 Questionnaire and Measurement

The core instrument contained 20 closed-ended statements rated on a five-point Likert response scale:
1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, and 5 = Strongly Agree. This response structure follows the summated-rating approach introduced by Likert (1932). Five items measured each of the four SIS quality dimensions. A separate categorical question assessed preference for SIS Version 2 or Version 3.

Table 3. Operationalization of the questionnaire dimensions

Dimension	Items	Content assessed
Reliability	5	Accuracy, dependable outputs, grade-report quality, and clarity of retrieved information
Efficiency	5	Report response, information exchange, data-entry performance, report generation, and reduction of routine procedures
Security	5	Confidential access, permission settings, data recovery, password support, and prevention of unauthorized access
Usability	5	Visual comfort, font clarity, homepage organization, icon consistency, and interface guidance

3.5 Score Calculation and Interpretation

Individual Likert items were treated as ordinal responses. For each participant, however, the five items belonging to a dimension were averaged to form a multi-item composite score. Aggregated Likert scores are commonly analyzed using means and parametric procedures when the scale contains several related items and the inferential assumptions are assessed [38]. For participant j and dimension d, the composite score was calculated as:

$$\bar{x}_{jd} = \frac{1}{k_d}\sum_{i=1}^{k_d} x_{ijd} \tag{1}$$

where x_{ijd} denotes participant *j*'s response to item *i* within dimension *d*, and $k_d = 5$ denotes the number of items included in dimension *d*. Higher scores indicated more favorable perceptions.
Item and dimension means were converted to weighted percentages to express their positions on the five-point response scale:

$$WP = \frac{\bar{x}}{L} \times 100, \qquad L = 5 \tag{2}$$

where **WP** denotes the weighted percentage, $\bar{x}$ denotes the mean score for the relevant item or dimension, and **L** denotes the maximum possible Likert-scale score A weighted percentage represents a linear transformation of the mean score; therefore, it should not be interpreted as the percentage of respondents who selected the agreement categories.
Weighted percentages were interpreted consistently using five equal-width categories, as presented in Table 4. These categories describe the position of a mean score on the response scale and should not be interpreted as the percentage of respondents who agreed or disagreed.

Table 4. Interpretation of weighted questionnaire scores

Weighted percentage	Equivalent mean range	Interpretation
20.00-35.99%	1.00-1.79	Very low
36.00-51.99%	1.80-2.59	Low
52.00-67.99%	2.60-3.39	Moderate
68.00-83.99%	3.40-4.19	High
84.00-100.00%	4.20-5.00	Very high

3.6 Questionnaire Validity and Reliability

Content validity was assessed by specialists from the Department of Statistics and the Faculty of Information Technology at Sebha University. Their feedback was used to improve the clarity, wording, and relevance of the questionnaire statements. A pilot assessment involving 20 participants from the target population was conducted before the main survey.
Item-dimension consistency was examined using Spearman correlations between each item and the corresponding dimension score. Spearman's coefficient evaluates monotonic association through ranked variables and is suitable for ordinal responses [39]. In its general rank-correlation form, it was defined as:

$$\rho_S = \frac{\mathrm{Cov}(R_X, R_Y)}{\sigma_{R_X}\sigma_{R_Y}}$$

(3)

where $\mathbf{R_x}$ and $\mathbf{R_Y}$ denote the ranked scores for the item and its corresponding dimension, respectively. All reported coefficients were positive and statistically significant (**$p < 0.001$**), with values ranging from **$r_s = 0.562$** to **$r_s = 0.889$**. Because the available report did not specify whether each item was excluded from its corresponding dimension total before calculating the correlation, the coefficients are reported as **item–dimension rank correlations** rather than **corrected item–total correlations.**

Internal consistency was assessed using Cronbach's alpha, Alpha summarizes the covariance among items but does not, by itself, establish unidimensional or validity; it must be interpreted in relation to the construct and item set [40] It was calculated as:

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum_{i=1}^{k}\sigma_i^2}{\sigma_T^2}\right)$$

(4)

where **k** denotes the number of items, $\boldsymbol{\sigma_i^2}$ denotes the variance of item *i*, and $\boldsymbol{\sigma_t^2}$ denotes the variance of the total score. The dimension-specific Cronbach's alpha coefficients ranged from **$\alpha = 0.781$** to **$\alpha = 0.868$**, whereas the overall 20-item scale demonstrated high internal consistency, with **$\alpha = 0.916$**.

Table 5. Item-dimension correlations and internal consistency

Dimension	Items	Spearman correlation range	Cronbach's alpha
Reliability	5	0.699-0.808	0.839
Efficiency	5	0.562-0.866	0.781
Security	5	0.602-0.784	0.793
Usability	5	0.600-0.889	0.868
Overall questionnaire	20	0.562-0.889	0.916

3.7 Data Collection Procedure

The questionnaire began with an introductory statement identifying the purpose of the study and explaining the nature of participation. Questionnaires were distributed to students and teaching staff during 2022. Returned forms were reviewed for completeness and eligibility before entry into the analytical dataset. Results were summarized at group level to compare the experiences of students and teaching staff.

3.8 Statistical Analysis

Data were analyzed using SPSS. Frequencies and percentages summarized categorical variables and item-response distributions. Means and standard deviations described multi-item composite scores. Weighted percentages were calculated using Equation 2. Students and teaching staff were summarized separately before any combined-sample estimates were reported.

Welch's independent-samples t test was used for the primary between-group comparisons because the groups were independent and markedly unequal in size, and equality of population variances was not assumed. Welch's procedure was developed for comparisons involving unequal variances [41]. With teaching staff designated group F and students group S, the test statistic was:

$$t = \frac{\bar{x}_F - \bar{x}_S}{\sqrt{\frac{s_F^2}{n_F} + \frac{s_S^2}{n_S}}}$$

(5)

The approximate Welch-Satterthwaite degrees of freedom were calculated as:

$$\nu = \frac{\left(\frac{s_F^2}{n_F} + \frac{s_S^2}{n_S}\right)^2}{\frac{(s_F^2/n_F)^2}{n_F - 1} + \frac{(s_S^2/n_S)^2}{n_S - 1}}$$

(6)

In Equations 5 and 6, $\bar{x}_g$, s^2_g, and n_g denote the sample mean, sample variance, and sample size. Mean differences were calculated as teaching staff minus students and reported with 95% confidence intervals. Two-sided tests were used.
Because the teaching-staff sample was small, the standardized mean difference was reported using Hedges' g, which applies a small-sample correction to the standardized mean difference [42]:

$$s_p = \sqrt{\frac{(n_F-1)s_F^2 + (n_S-1)s_S^2}{n_F + n_S - 2}}, \quad g = J\frac{\bar{x}_F - \bar{x}_S}{s_p} \tag{7}$$

$$J \approx 1 - \frac{3}{4(n_F + n_S) - 9} \tag{8}$$

Effect sizes were interpreted as estimates with direction and magnitude, alongside their confidence intervals and p values, rather than as substitutes for statistical or substantive judgment.
The four dimension-level comparisons formed the primary family of hypotheses. To control the family-wise error rate, raw p values were ordered from smallest to largest and evaluated using Holm's sequentially rejective procedure [43]:

$$p_{(i)} \leq \frac{\alpha}{m - i + 1}, \qquad i = 1, \ldots, m \tag{9}$$

Here, m = 4 for the primary dimension-level family. Testing proceeded from the smallest p value and stopped at the first hypothesis that did not meet its sequential threshold. For exploratory item-level comparisons, a separate Holm correction was applied to the five items within each dimension.
If a composite-score distribution showed substantial non-normality or influential outliers, the Mann-Whitney U test was specified as a sensitivity analysis for the two independent groups [44]. Because the test evaluates distributions and stochastic ordering, it was not described automatically as a test of medians unless similarly shaped group distributions justified that interpretation.
Preference for SIS Version 2 versus Version 3 was summarized using counts and percentages. Fisher's exact test was used when an expected cell count was below five [45]. For a 2 x 2 table with cell counts a, b, c, and d and total n, the conditional probability of a particular table is:

$$P = \frac{(a+b)!\,(c+d)!\,(a+c)!\,(b+d)!}{a!\,b!\,c!\,d!\,n!} \tag{10}$$

The strength of the association was reported as an odds ratio with a 95% confidence interval:

$$OR = \frac{ad}{bc} \tag{11}$$

All tests were two-sided. Statistical significance was defined as $p < 0.05$ for single tests and as Holm-adjusted $p < 0.05$ for prespecified families of multiple comparisons. Exact p values, confidence intervals, and effect sizes were reported whenever applicable.
The analyses evaluated perceived system quality. They did not constitute direct technical measurements of server availability, response time, database accuracy, vulnerability, access-control effectiveness, recovery performance, or task-completion efficiency.

3.9 Scope of the Evaluation

The study was limited to users within the Faculty of Information Technology at Sebha University and assessed perceptions at one point in time. Objective system logs, penetration testing, recovery exercises, performance benchmarks, and controlled usability tasks were outside the study scope. The findings should therefore be interpreted as stakeholder-reported evidence that can guide, but not replace, objective technical evaluation.

4. Result and Discussion

4.1 Participant Response and Analytical Sample

A total of 155 questionnaires were distributed: 134 to students and 21 to teaching staff. Of these, 130 valid questionnaires were returned, producing an overall response rate of 83.9%. The final analytical sample comprised 110 students and 20 teaching staff members. Students represented 84.6% of the valid sample, whereas teaching staff represented 15.4%. Results for the two participant groups should be presented separately before conducting comparisons between their evaluations, because their roles and interactions with the Student Information System differ.

Table 6. Questionnaire Response and Analytical Sample

Participant group	Distributed	Valid responses	Response rate	Percentage of analytical sample
Students	134	110	82.1%	84.6%
Teaching staff	21	20	95.2%	15.4%
Total	155	130	83.9%	100.0%

4.2 Comparison of Student and Teaching-Staff Evaluations

Table 7 compares students' and teaching staff members' evaluations of the four non-functional quality dimensions. Teaching staff recorded higher mean scores across all dimensions. However, statistically significant differences were found only for efficiency and security after applying the Holm correction for multiple comparisons.

Table 7. Comparison of Student and Teaching-Staff Perceptions of SIS Quality

Dimension	Students, n = 110 Mean ± SD	Teaching staff, n = 20 Mean ± SD	Mean difference (95% CI)	Welch's t (df)	Adjusted p	Hedges' g
Reliability	2.97 ± 0.72	3.18 ± 0.66	0.21 (−0.12 to 0.54)	1.29 (27.88)	0.306	0.29
Efficiency	3.20 ± 0.68	3.66 ± 0.61	0.46 (0.15 to 0.77)	3.05 (28.30)	0.020	0.68
Security	3.34 ± 0.64	3.76 ± 0.57	0.42 (0.13 to 0.71)	2.97 (28.45)	0.020	0.66
Usability	3.14 ± 0.75	3.39 ± 0.69	0.25 (−0.10 to 0.60)	1.47 (27.82)	0.306	0.34

Mean differences were calculated as teaching staff minus students. Positive values therefore indicate higher teaching-staff evaluations. Probability values were adjusted using the Holm procedure. Bold values indicate statistical significance at adjusted p *< 0.05.*

Teaching staff reported a higher mean reliability score than students (3.18 ± 0.66 versus 2.97 ± 0.72). The mean difference was 0.21 points, but its 95% confidence interval included zero (95% CI: −0.12 to 0.54). Consequently, the difference was not statistically significant after adjustment, $t(27.88) = 1.29$, adjusted $p = 0.306$. Hedges' g = 0.29 indicated a small difference between the groups.

A statistically significant difference was observed for efficiency. Teaching staff provided a higher evaluation than students (3.66 ± 0.61 versus 3.20 ± 0.68), with a mean difference of 0.46 points (95% CI: 0.15 to 0.77). This difference remained significant following the Holm correction, $t(28.30) = 3.05$, adjusted $p = 0.020$. The effect size was moderate to large, Hedges' g = 0.68, suggesting that the difference was also practically meaningful.

Teaching staff similarly rated security more positively than students (3.76 ± 0.57 versus 3.34 ± 0.64). The estimated mean difference was 0.42 points (95% CI: 0.13 to 0.71), and the difference remained statistically significant after adjustment, $t(28.45) = 2.97$, adjusted $p = 0.020$. The corresponding Hedges' g of 0.66 indicated a moderate difference.

For usability, teaching staff recorded a higher mean score than students (3.39 ± 0.69 versus 3.14 ± 0.75). Nevertheless, the mean difference of 0.25 points was not statistically significant because its confidence interval crossed zero (95% CI: −0.10 to 0.60), $t(27.82) = 1.47$, adjusted $p = 0.306$. Hedges' g = 0.34 indicated a small difference.

Overall, the comparison suggests that teaching staff perceived the SIS more favorably than students across all four dimensions. The clearest group differences concerned efficiency and security, whereas the evidence was insufficient to establish statistically significant differences in reliability and usability.

4.3 Reliability Results

Table 8 presents the reliability evaluations reported by students and teaching staff. The overall student mean was 2.97 ± 0.72, corresponding to a weighted score of 59.4%, whereas teaching staff recorded a mean of 3.18 ± 0.66 and a weighted score of 63.6%. Both evaluations fell within the moderate range.

Table 8. Student and Teaching-Staff Evaluations of SIS Reliability

Reliability item	Students Mean ± SD	Students weighted score	Staff Mean ± SD	Staff weighted score	Mean difference	Adjusted *p*
Accuracy and reliability of extracted data	3.18 ± 1.05	63.6%	3.30 ± 0.90	66.0%	0.12	1.000
Dependability of system outputs for assessing academic performance	3.55 ± 1.09	71.0%	3.70 ± 0.82	74.0%	0.15	1.000
Detailed and error-free reporting of grades	2.64 ± 1.23	52.8%	2.85 ± 1.00	57.0%	0.21	1.000
Grade reports without repetition or duplicated text	2.29 ± 1.27	45.8%	2.70 ± 1.04	54.0%	0.41	0.641
Retrieval of clear and understandable information	3.19 ± 1.01	63.8%	3.35 ± 0.88	67.0%	0.16	1.000
Overall reliability score	2.97 ± 0.72	59.4%	3.18 ± 0.66	63.6%	0.21	0.306

Mean differences were calculated as teaching staff minus students. Item-level probability values were obtained using Welch's independent-samples t-test and adjusted using the Holm procedure.

The highest-rated reliability item in both groups concerned the dependability of system outputs for assessing academic performance. Students assigned this item a mean score of 3.55 ± 1.09, while teaching staff assigned it a mean of 3.70 ± 0.82. The corresponding weighted scores were 71.0% and 74.0%, respectively, placing this item within the high evaluation category for both groups.

The lowest student evaluation concerned repetition or duplicated text in grade reports, with a mean of 2.29 ± 1.27 and a weighted score of 45.8%, indicating a low evaluation. Teaching staff evaluated the same item more favorably, although its mean of 2.70 ± 1.04 and weighted score of 54.0% remained within the moderate range. This was the largest item-level difference between the groups, with teaching staff scoring the item 0.41 points higher than students. Nevertheless, the difference was not statistically significant after correction for multiple comparisons, adjusted $p = 0.641$.

Detailed and error-free grade reporting also received relatively weak evaluations. Students recorded a mean of 2.64 ± 1.23, compared with 2.85 ± 1.00 among teaching staff. These scores indicate that concerns about the accuracy and presentation of grade-related information were shared by both groups.

Although teaching staff provided higher mean scores for all five reliability items, none of the item-level differences remained statistically significant following Holm adjustment. Similarly, the difference in the overall reliability score was not statistically significant, adjusted $p = 0.306$. Therefore, the findings indicate a broadly similar perception of SIS reliability among students and teaching staff, with both groups identifying grade-report quality as the principal area of weakness.

4.4 Efficiency Results

Table 9 presents the efficiency evaluations reported by students and teaching staff. The overall mean among students was 3.20 ± 0.68, corresponding to a weighted score of 64.0%. Teaching staff reported a higher mean of 3.66 ± 0.61 and a weighted score of 73.2%. Accordingly, students provided a moderate evaluation, whereas teaching staff provided a high evaluation of SIS efficiency.

Table 9. Student and Teaching-Staff Evaluations of SIS Efficiency

Efficiency item	Students Mean ± SD	Students weighted score	Staff Mean ± SD	Staff weighted score	Mean difference	Adjusted p
Response when displaying statements and reports	3.11 ± 1.10	62.2%	3.55 ± 0.83	71.0%	0.44	0.094
Ease of information exchange among system users	2.62 ± 1.20	52.4%	3.30 ± 0.95	66.0%	0.68	0.042
Efficiency during data-entry processes	3.27 ± 1.00	65.4%	3.75 ± 0.79	75.0%	0.48	0.069
Speed and efficiency of report generation	3.34 ± 0.90	66.8%	3.80 ± 0.73	76.0%	0.46	0.064

Reduction of routine procedures for students and instructors	3.66 ± 1.20	73.2%	3.90 ± 0.78	78.0%	0.24	0.321
Overall efficiency score	3.20 ± 0.68	64.0%	3.66 ± 0.61	73.2%	0.46	0.020

Mean differences were calculated as teaching staff minus students. Item-level probability values were adjusted across the five efficiency items using the Holm procedure. The overall adjusted probability value was obtained from the comparison of the four questionnaire dimensions.

Teaching staff reported higher mean scores than students for all five efficiency items. The greatest difference concerned the ease of information exchange among system users. Students recorded a mean of 2.62 ± 1.20, compared with 3.30 ± 0.95 among teaching staff. The mean difference was 0.68 points and remained statistically significant after correction for multiple item-level comparisons, adjusted $p = 0.042$. Nevertheless, both weighted scores remained within the moderate evaluation range.

Among students, the most positively evaluated item concerned the system's ability to reduce routine procedures, with a mean of 3.66 ± 1.20 and a weighted score of 73.2%. Teaching staff also rated this item positively, recording a mean of 3.90 ± 0.78 and a weighted score of 78.0%. Both values represented a high evaluation.

Teaching staff rated data-entry efficiency and report-generation efficiency highly, with weighted scores of 75.0% and 76.0%, respectively. The corresponding student scores were lower and remained within the moderate range. Although the item-level differences approached statistical significance, they did not remain significant after Holm adjustment.

At the dimension level, teaching staff rated SIS efficiency significantly more positively than students. The mean difference was 0.46 points (95% CI: 0.15 to 0.77), Welch's $t(28.30) = 3.05$, adjusted $p = 0.020$. Hedges' $g = 0.68$ indicated a moderate-to-large difference between the two groups.

Overall, the findings suggest that teaching staff experienced greater efficiency benefits from the SIS than students. Information exchange represented the principal weakness from the students' perspective, whereas reducing routine procedures received the strongest evaluation in both groups.

4.5 Security Results

Security received the highest overall evaluation among the four dimensions for both participant groups. Students recorded an overall mean of 3.34 ± 0.64 and a weighted score of 66.9%, representing a moderate evaluation. Teaching staff reported a higher mean of 3.76 ± 0.57 and a weighted score of 75.2%, representing a high evaluation.

Table 10. Student and Teaching-Staff Evaluations of SIS Security

Security item	Students Mean ± SD	Students weighted score	Staff Mean ± SD	Staff weighted score	Mean difference	Adjusted *p*
Confidentiality when accessing and viewing information	3.63 ± 1.07	72.7%	4.05 ± 0.68	81.0%	0.42	0.109
Availability of user-permission settings	3.44 ± 1.16	68.9%	3.85 ± 0.74	77.0%	0.41	0.113
Recovery of data and information following loss	2.88 ± 1.14	57.6%	3.25 ± 0.91	65.0%	0.37	0.119
Technical support for forgotten passwords	3.28 ± 0.97	65.6%	3.70 ± 0.76	74.0%	0.42	0.113
Prevention of unauthorized access	3.49 ± 1.08	69.8%	3.95 ± 0.70	79.0%	0.46	0.094
Overall security score	3.34 ± 0.64	66.9%	3.76 ± 0.57	75.2%	0.42	0.020

Mean differences were calculated as teaching staff minus students. Item-level probability values were adjusted across the five security items using the Holm procedure. The overall adjusted probability value was obtained from the comparison of the four questionnaire dimensions.

Confidentiality when accessing and viewing system information received the highest evaluation from both groups. Students reported a mean of 3.63 ± 1.07 and a weighted score of 72.7%, whereas teaching staff reported a mean of 4.05 ± 0.68 and a weighted score of 81.0%. These results indicate a high evaluation of access confidentiality, although the teaching-staff score approached the upper boundary of the high category.

The prevention of unauthorized access was also evaluated positively. Students recorded a mean of 3.49 ± 1.08 and a weighted score of 69.8%, compared with 3.95 ± 0.70 and 79.0% among teaching staff. This item demonstrated the largest difference between the groups at 0.46 points. However, the difference did not remain statistically significant following adjustment for the five item-level comparisons, adjusted $p = 0.094$.

Data-recovery capability received the lowest security evaluation from both groups. Students reported a mean of 2.88 ± 1.14 and a weighted score of 57.6%, while teaching staff reported a mean of 3.25 ± 0.91 and a weighted score of 65.0%. Both scores fell within the moderate range, indicating that data recovery remained a perceived weakness despite the generally favorable evaluation of security.

Teaching staff also rated user-permission settings and password-related technical support more positively than students. Nevertheless, none of the five-individual security-item differences remained statistically significant after Holm adjustment.

At the dimension level, teaching staff rated SIS security significantly more positively than students. The mean difference was 0.42 points (95% CI: 0.13 to 0.71), Welch's $t(28.45) = 2.97$, adjusted $p = 0.020$. Hedges' $g = 0.66$ indicated a moderate-to-large difference between the participant groups.

Although no individual item remained significant after correction, the overall security dimension was significant because the composite score combined information across all five items and consequently provided a more stable measurement. Overall, the results suggest that access control and confidentiality were the strongest perceived security features, whereas data recovery represented the principal area requiring improvement.

4.6 Usability Results

Table 11 presents student and teaching-staff evaluations of SIS usability. Students recorded an overall mean of 3.14 ± 0.75 and a weighted score of 62.8%. Teaching staff reported a higher mean of 3.39 ± 0.69 and a weighted score of 67.8%. Under the adopted interpretation ranges, both groups provided a moderate overall evaluation of usability.

Table 11. Student and Teaching-Staff Evaluations of SIS Usability

Usability item	Students Mean ± SD	Students weighted score	Staff Mean ± SD	Staff weighted score	Mean difference	Adjusted *p*
Harmony and visual comfort of interface colors	3.60 ± 1.02	72.1%	3.85 ± 0.78	77.0%	0.25	0.879
Clarity and visibility of font size	3.61 ± 1.12	72.3%	3.90 ± 0.73	78.0%	0.29	0.727
Classification and arrangement of homepage information	3.04 ± 1.32	60.9%	3.30 ± 0.98	66.0%	0.26	0.933
Consistency and arrangement of interface icons	2.70 ± 1.23	54.0%	2.95 ± 1.02	59.0%	0.25	0.933
Explanations and guidance for interface components	2.72 ± 1.09	54.5%	2.95 ± 0.95	59.0%	0.23	0.933
Overall usability score	3.14 ± 0.75	62.8%	3.39 ± 0.69	67.8%	0.25	0.306

Mean differences were calculated as teaching staff minus students. Item-level probability values were adjusted across the five usability items using the Holm procedure. The overall adjusted probability value was obtained from the comparison of the four questionnaire dimensions.

Font clarity and visibility received the highest evaluation from both groups. Students reported a mean of 3.61 ± 1.12 and a weighted score of 72.3%, while teaching staff reported a mean of 3.90 ± 0.73 and a weighted score of 78.0%. Both scores represented a high evaluation.

The visual comfort of interface colors was also evaluated positively. Students recorded a mean of 3.60 ± 1.02 and a weighted score of 72.1%, compared with 3.85 ± 0.78 and 77.0% among teaching staff. These results indicate that the system's fundamental visual characteristics were viewed more favorably than its navigational and explanatory features.

The organization of homepage information received moderate evaluations from both groups. Students reported a weighted score of 60.9%, whereas teaching staff reported 66.0%. The between-group mean difference was 0.26 points and was not statistically significant after adjustment, adjusted $p = 0.933$.

The two lowest-rated usability items concerned the consistency and arrangement of interface icons and the availability of explanations for interface components. Students assigned weighted scores of 54.0% and 54.5% to these items, respectively. Teaching staff provided slightly higher scores of 59.0% for both items, but these evaluations also remained within the moderate range.

None of the five item-level differences between students and teaching staff was statistically significant after Holm adjustment. At the dimension level, the mean difference was 0.25 points (95% CI: −0.10 to 0.60), Welch's $t(27.82) = 1.47$, adjusted $p = 0.306$. Hedges' $g = 0.34$ indicated a small difference between the groups.
Overall, the usability results demonstrate that both groups responded positively to font visibility and interface colors but expressed weaker perceptions of icon organization and user guidance. Although teaching staff rated every usability item more favorably than students, the evidence was insufficient to establish a statistically significant difference in overall usability perceptions.

4.7 Summary of the Four Non-Functional Quality Dimensions

Table 12 summarizes the evaluations of reliability, efficiency, security, and usability among students, teaching staff, and the combined analytical sample. Teaching staff reported higher mean scores than students across all four dimensions. Security received the highest evaluation in both groups, while reliability received the lowest.

Table 12. Summary and Comparison of the Four SIS Quality Dimensions

Dimension	Students Mean ± SD	Students weighted score	Staff Mean ± SD	Staff weighted score	Combined Mean ± SD	Combined weighted score	Adjusted *p*	Hedges' *g*
Reliability	2.97 ± 0.72	59.4%	3.18 ± 0.66	63.6%	3.00 ± 0.71	60.0%	0.306	0.29
Efficiency	3.20 ± 0.68	64.0%	3.66 ± 0.61	73.2%	3.27 ± 0.69	65.4%	**0.020**	0.68
Security	3.34 ± 0.64	66.9%	3.76 ± 0.57	75.2%	3.40 ± 0.65	68.1%	**0.020**	0.66
Usability	3.14 ± 0.75	62.8%	3.39 ± 0.69	67.8%	3.18 ± 0.74	63.6%	0.306	0.34

Combined statistics were calculated across the 130 participants. Adjusted probability values refer to student–staff comparisons using Welch's independent-samples t-test with Holm correction across the four dimensions. Positive effect sizes indicate higher teaching-staff evaluations.
Security ranked first among students, teaching staff, and the combined sample. Students reported a weighted security score of 66.9%, representing a moderate evaluation, whereas teaching staff reported 75.2%, representing a high evaluation. The combined weighted score was 68.1%, which fell marginally within the high category.
Efficiency ranked second in both groups. Students provided a moderate evaluation of 64.0%, while the teaching-staff evaluation was high at 73.2%. The combined efficiency score was 65.4%, representing a moderate evaluation.
Usability ranked third, with weighted scores of 62.8% among students and 67.8% among teaching staff. Both values remained within the moderate range. The combined weighted score was 63.6%.
Reliability ranked last in both groups. Students reported a weighted score of 59.4%, compared with 63.6% among teaching staff. The combined reliability score was 60.0%, indicating that reliability remained the weakest perceived dimension of SIS quality.
Statistically significant student–staff differences were found for efficiency and security, with moderate-to-large effect sizes. The group differences in reliability and usability were smaller and were not statistically significant after correction for multiple comparisons.
Overall, the combined results indicate that SIS quality was perceived as moderate in reliability, efficiency, and usability. Security was the only dimension to reach the high category in the combined analysis, although its score of 68.1% was close to the category threshold. These findings should therefore be interpreted as indicating a relative strength in perceived security rather than uniformly strong system security.
Figure 1 illustrates that teaching staff assigned higher weighted scores than students across all four dimensions. The largest differences concerned efficiency and security, whereas smaller differences were observed for reliability and usability. Security ranked highest and reliability ranked lowest in both participant groups. The figure represents perceived system quality and should not be interpreted as an objective technical assessment of SIS performance.

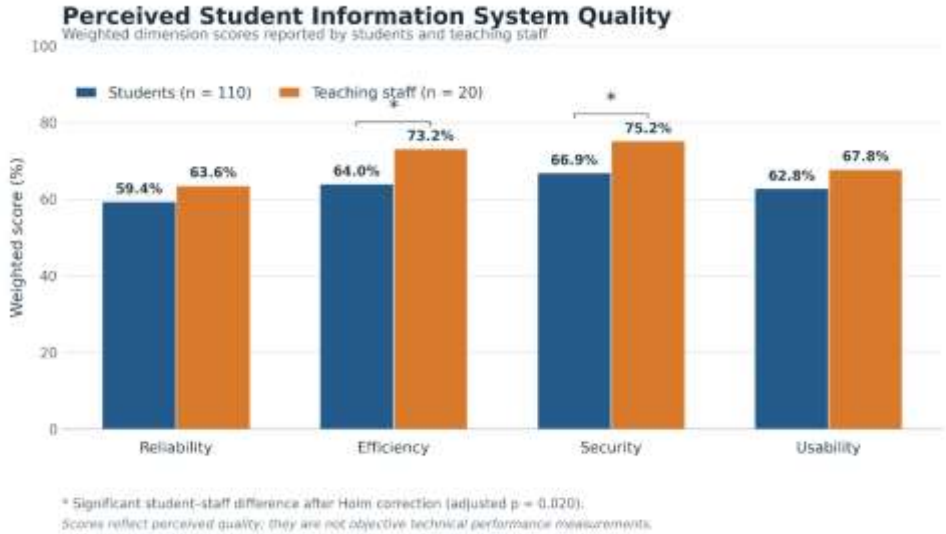

Figure 1. Comparison of Weighted SIS Quality Scores Reported by Students and Teaching Staff

4.8 Analysis of Student Information System Version Preferences

Table 13 presents participant preferences regarding the two SIS versions. Among students, 94 of 110 respondents (85.5%) preferred Version 2, whereas 16 students (14.5%) preferred Version 3. Among teaching staff, 14 of 20 respondents (70.0%) preferred Version 2, while 6 staff members (30.0%) preferred Version 3.

Table 13. SIS Version Preferences by Participant Group

Participant group	Version 2, *n* (%)	Version 3, *n* (%)	Total
Students	94 (85.5%)	16 (14.5%)	110 (100%)
Teaching staff	14 (70.0%)	6 (30.0%)	20 (100%)
Combined sample	108 (83.1%)	22 (16.9%)	130 (100%)

Version 2 was preferred by a majority of both participant groups. However, preference for Version 2 was more pronounced among students than teaching staff: 85.5% compared with 70.0%. Conversely, teaching staff selected Version 3 more frequently than students: 30.0% compared with 14.5%.

Because one expected cell count was below five, Fisher's exact test was used instead of relying solely on Pearson's chi-square test. The association between participant group and preferred SIS version was not statistically significant, Fisher's exact $p = 0.107$.

The odds of preferring Version 2 rather than Version 3 were approximately 2.52 times higher among students than teaching staff (odds ratio = 2.52; 95% CI: 0.84–7.51). However, the confidence interval included 1.00, confirming that the observed group difference was not statistically conclusive.

Overall, 108 of the 130 participants (83.1%) preferred Version 2, compared with 22 participants (16.9%) who preferred Version 3. This substantial overall preference suggests that users perceived Version 2 more favorably. Nevertheless, the questionnaire did not include a controlled comparative usability assessment of the two versions. Therefore, the result should be interpreted as a subjective user preference rather than objective evidence that Version 2 demonstrated superior technical performance.

5. Discussion

This study evaluated student and teaching-staff perceptions of four non-functional quality dimensions of the Student Information System: reliability, efficiency, security, and usability. The findings demonstrate that the system was not perceived uniformly across either dimensions or participant groups. Security emerged as the strongest dimension, whereas reliability represented the weakest. Teaching staff consistently provided higher evaluations than students, although statistically significant group differences were limited to efficiency and security.

5.1 Overall Evaluation of SIS Quality

The combined analysis showed that security received the highest weighted score at 68.1%, followed by efficiency at 65.4%, usability at 63.6%, and reliability at 60.0%. Reliability, efficiency, and usability were therefore evaluated at a moderate level, while security marginally reached the high category.

The security score should be interpreted cautiously because it was close to the 68% threshold separating moderate and high evaluations. Furthermore, questionnaire scores reflect users' perceptions rather than direct evidence of system security, availability, response time, or data accuracy. Consequently, the findings identify perceived strengths and weaknesses but do not replace technical system testing.

5.2 Differences Between Students And Teaching Staff

Teaching staff reported higher scores than students across all four dimensions. Significant differences were observed for efficiency and security after controlling for multiple comparisons.

For efficiency, teaching staff reported a mean score of 3.66, compared with 3.20 among students. The adjusted difference was statistically significant, $p = 0.020$, with Hedges' $g = 0.68$. This moderate-to-large effect suggests that the difference may be practically meaningful rather than merely a consequence of sample variation.

A similar pattern was observed for security. Teaching staff reported a mean score of 3.76, compared with 3.34 among students. The difference was statistically significant, adjusted $p = 0.020$, with Hedges' $g = 0.66$.

Several factors could explain these differences. Teaching staff and students may use different system functions, receive different levels of access or technical support, and interact with the system for different purposes. Teaching staff may primarily use structured administrative functions, whereas students depend heavily on grade reporting, information retrieval, and routine academic services. These explanations remain interpretive because system-use frequency, access level, digital experience, and technical-support exposure were not directly measured.

Differences in reliability and usability were smaller and were not statistically significant. These findings suggest that students and teaching staff shared broadly similar perceptions of these two dimensions, despite the teaching staff's slightly higher mean scores.

5.3 Reliability

Reliability received the lowest evaluation in both groups. Students reported a weighted score of 59.4%, compared with 63.6% among teaching staff. The overall group difference was not statistically significant, adjusted $p = 0.306$. The strongest reliability item concerned the dependability of system outputs for assessing academic performance. In contrast, the weakest items concerned detailed, error-free grade reporting and the absence of duplicated or repeated text. Students gave the repetition-related item a weighted score of only 45.8%, placing it within the low category.

These findings are important because grade reports represent official academic information. Repetition, errors, or unclear presentation may reduce users' trust in the system even when other functions operate adequately. Reliability improvements should therefore prioritize output accuracy, consistency, and clarity rather than focusing exclusively on system availability.

5.4 Efficiency

Efficiency demonstrated one of the clearest differences between participant groups. Students provided a moderate evaluation of 64.0%, whereas teaching staff provided a high evaluation of 73.2%.

The ease of information exchange among system users represented the weakest efficiency item from the students' perspective. It also produced the largest item-level group difference and remained statistically significant after Holm correction, adjusted $p = 0.042$. This suggests that students may encounter greater difficulty exchanging or obtaining information through the system than teaching staff.

The reduction of routine procedures received the strongest evaluation from both groups. This indicates that the SIS may provide recognizable administrative benefits despite weaknesses in communication and information exchange.

5.5 Security

Security ranked first in both participant groups. Confidential access, permission settings, and prevention of unauthorized access received relatively favorable evaluations. These findings suggest that users generally viewed access-control mechanisms as a relative system strength.

Data recovery received the lowest security evaluation. Students assigned this item a weighted score of 57.6%, while teaching staff assigned it 65.0%. This result distinguishes access control from operational resilience: users may believe that unauthorized access is reasonably controlled while remaining uncertain about whether lost information can be recovered.

No individual security-item difference remained statistically significant following correction for five comparisons. Nevertheless, the overall security composite differed significantly between students and teaching staff. This is statistically plausible because a composite score combines information across several related items and generally provides a more stable measurement than individual questions.

Perceived security should not be treated as evidence that the SIS is technically secure. Confirmation would require penetration testing, vulnerability assessment, access-log examination, recovery testing, and evaluation of authentication and authorization controls.

5.6 Usability

Usability received moderate evaluations from both students and teaching staff, with weighted scores of 62.8% and 67.8%, respectively. The group difference was not statistically significant, adjusted $p = 0.306$.

Font clarity and visually comfortable colors were the strongest usability features. Conversely, interface-icon organization and explanations of interface components received the weakest evaluations. This pattern indicates that visual appearance alone was not the principal usability problem. Greater weaknesses were associated with navigation consistency and user guidance.

Improving usability should therefore include consistent icon placement, clearer navigation labels, explanations of unfamiliar functions, and task-based usability testing. Such testing should observe whether users can complete common tasks accurately and efficiently rather than relying only on satisfaction scores.

5.7 Preference For Sis Version

Version 2 was preferred by 85.5% of students and 70.0% of teaching staff. Across the combined sample, 83.1% preferred Version 2, compared with 16.9% who preferred Version 3.

Although students appeared more likely than teaching staff to prefer Version 2, the association between participant group and version preference was not statistically significant, Fisher's exact $p = 0.107$. The odds ratio was 2.52, but its confidence interval was wide and included the null value (95% CI: 0.84–7.51).

The broad confidence interval reflects uncertainty arising partly from the small teaching-staff sample. Therefore, the evidence supports a strong overall preference for Version 2 but does not conclusively demonstrate that the strength of this preference differs between students and staff.

User preference should not be equated with technical superiority. The preference may reflect familiarity, workflow continuity, visual design, ease of navigation, resistance to change, or differences in functionality. A controlled comparison would be required to determine whether one version produces better task-completion time, accuracy, satisfaction, or error rates.

5.8 Practical Interpretation

The findings identify three principal priorities:

1. Improve the accuracy, consistency, and presentation of grade-related information.
2. Strengthen information exchange and student-facing workflow efficiency.
3. Improve data-recovery mechanisms, interface guidance, and navigation consistency.

The results also demonstrate the importance of analyzing students and teaching staff separately. A combined analysis alone could conceal meaningful differences in how stakeholder groups experience the system, particularly in efficiency and security.

5.9 Study Limitations

The findings should be interpreted in view of several limitations. First, the study measured perceived quality rather than objective technical performance. Second, the teaching-staff sample was small, reducing statistical precision and producing relatively wide confidence intervals. Third, the cross-sectional design cannot establish causal relationships. Fourth, responses may have been affected by recall, expectations, previous experience, or familiarity with a particular system version.

In addition, the study was conducted within one faculty at one university, which limits the generalizability of the findings. The questionnaire also did not measure frequency of system use, digital competence, user-access level, or exposure to technical support. These factors could partly explain the differences between students and teaching staff.

Despite these limitations, the inclusion of group-specific descriptive statistics, confidence intervals, corrected significance tests, and standardized effect sizes provides a more informative evaluation than relying solely on percentages and rankings.

6. Conclusion :

This study evaluated students' perceptions of four non-functional quality dimensions of the Student Information System (SIS) used at the Faculty of Information Technology, Sebha University. Among the student respondents, security received the highest weighted score (66.9%), followed by efficiency (64.0%), usability (62.8%), and reliability (59.4%). Although all four dimensions were evaluated at a moderate level, reliability represented the weakest aspect of the system. Students' responses particularly highlighted concerns related to the accuracy and clarity of academic reports, repeated or duplicated information, data recovery, information exchange, interface-icon organization, and the availability of guidance for unfamiliar system components.

The findings indicate that the university should prioritize improving the accuracy and clarity of academic reports. Grade reports should be systematically reviewed for incorrect values, spelling errors, missing information, inconsistent formatting, and duplicated text. Automated validation rules should also be implemented to identify incomplete, contradictory, or duplicated academic records before reports are released. In addition, the SIS should provide a stable and unified access structure, clearer notifications, accessible reports, and transparent mechanisms for submitting and tracking academic requests.

The relatively low evaluation of data recovery indicates the need for regular backups, recovery testing, versioned records, and documented disaster-recovery procedures. The university should also monitor system availability, transaction failures, report-generation errors, and database consistency using clearly defined performance indicators. Technical support should be strengthened, particularly for access problems, forgotten passwords, and requests related to academic information.

Interface improvements should focus on consistent placement and design of icons, menus, buttons, terminology, colors, and page structures across SIS modules. Clearer explanations should be provided through tooltips, brief instructions, frequently asked questions, task guidance, and searchable help materials. Structured usability testing should be conducted with students before future system versions are fully deployed, using task-completion time, error rates, success rates, and user satisfaction as complementary measures.

Version 2 was preferred by 85.5% of the participating students, whereas 14.5% preferred Version 3. This result indicates the need for a more detailed, user-centered evaluation of the changes introduced in the newer version. Future updates should therefore undergo pilot testing with representative students before university-wide implementation. Follow-up interviews or focus groups should also be conducted to determine whether the preference for Version 2 is related to familiarity, easier navigation, better performance, workflow continuity, or missing functionality in Version 3. A continuous user-feedback mechanism should be established to support error reporting, improvement requests, and monitoring of whether reported problems have been resolved.

These recommendations are based on students' perceived experience of the SIS and should not be interpreted as direct evidence of its technical reliability, security, efficiency, or usability. Future research should therefore complement questionnaire-based findings with objective performance indicators, technical security assessments, controlled task-based usability testing, and longitudinal evaluation following system modifications.

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