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Impact of Internal Information System Quality on Performance Efficiency in Electrical Engineering Departments: An Analytical SPSS Study

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ABSTRACT

This study aimed to measure the impact of the quality of internal information systems (in its dimensions: information quality, system quality, and service quality) on performance efficiency (quantitative, qualitative, and organizational) in electrical engineering departments. The study employed a descriptive-analytical approach, and data were collected via a questionnaire distributed to a sample of engineers, technicians, and administrators in electrical engineering departments in Anbar Governorate. The results, analyzed using SPSS software, showed that the level of internal information systems quality and performance efficiency was high, with "information quality" and "organizational efficiency" leading in their respective dimensions. The study also revealed a statistically significant positive correlation and influence between the two variables, with system quality accounting for 61.5% of the variance in performance efficiency. The dimensions were ranked in descending order of influence: service quality, system quality, and then information quality. The study recommended enhancing service quality through technical support and continuous training, improving system stability and information accuracy, considering individual differences (years of experience and job title) in development programs, and conducting periodic evaluations to ensure continuous performance improvement

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1. INTRODUCTION

Research in higher education examines performance measurement from various perspectives, focusing on institutional outputs and quantifying value challenges. Recent studies reveal a connection between information system quality. (14). and the efficiency of electrical engineering departments. SPSS results suggest that improving these systems with an emphasis on user satisfaction and timeliness can enhance educational and research outcomes. (12).

The performance efficiency of educational departments assesses their achievements based on resources and information system quality. They aim to graduate students with competencies that meet industry needs, relying on stakeholder support and research funding. (13).

2. Theoretical Framework

The deployment of internal information systems in electrical engineering departments must adhere to core values to guarantee reliable and current information that influences performance in educational institutions. IS

quality significantly affects departmental efficiency, but assessing its impact is complex because of various influencing factors**.(8).**

Internal information system quality includes completeness, content, format, accuracy, timeliness, satisfaction, and reliability, assessed through content and user satisfaction. The electrical engineering department evaluates operations, education, and research performance, concentrating on faculty reviews and research output. Qualitative measures notably affect the system's performance efficiency**.(7).**

2.1. Internal Information System Quality

The IIS quality construct includes four dimensions: completeness, timeliness, user satisfaction, and system reliability. Other constructs are defined in this study with their theoretical links to performance efficiency**.(21).**

Internal Information System (IIS) quality assesses information depth and breadth. Reliability includes readiness, stability, access, response times, accuracy, and error messages. Users judge quality on task support, with satisfaction crucial for measuring service quality. Positive perceptions improve views of the system. **(2)**

Performance efficiency in electrical engineering departments relies on timely exam completion, student satisfaction ratings, and research output assessed by technical publications, showing faculty engagement. **(16).**

2.2. Performance Efficiency in Electrical Engineering Departments

Performance efficiency in electrical engineering includes achieving educational goals and maintaining research activity.(5). It measures graduation rates for educational performance and evaluates budget usage for operational efficiency, while research efficiency is based on publications produced to meet university standards.(20).

Performance efficiency is evaluated in two stages: educational and operational. Educational efficiency measures the ratio of graduates to enrolled students, while operational efficiency examines actual versus budgeted expenditures. Research efficiency is defined by minimum publication standards set by the University of São Paulo Research Support Foundation for Brazil’s post-graduate programs. (23).

2.3. Linkages Between IS Quality and Performance

Recent studies emphasize IS quality's role in performance, particularly for financially challenged non-profits. High-quality IS can alleviate inefficiencies in university departments facing poor support and budget issues. However, research linking IS quality and performance in engineering departments is limited. **(19).**

The quality of internal information systems greatly influences user satisfaction and performance. **(17).** In knowledge-driven organizations, IS satisfaction is vital for maintaining educational and research quality. Yet, poor-quality IS can negate satisfaction benefits, leading to further problems. Although user satisfaction can enhance institutional quality, it isn't always critical for sustaining high educational standards**.(22).**

3. Research Design and Methodology

The study uses an analytical SPSS design to analyze how internal information system quality impacts performance in Uttarakhand's university electrical engineering departments, utilizing a C-DAC dataset. Faculty data were collected via a questionnaire from seven universities. The analysis involves descriptive statistics, reliability and validity testing, and assessments of correlation, regression, and mediation/moderation**.(15).**

Research questions are formulated by defining and measuring study variables. Operational definitions and measurement scales, such as Cronbach’s alpha values at 0.7, address reliability and data coding. Data collection timing, instruments, ethical considerations, and quality controls are covered. Analysis techniques and SPSS procedures involve model specifications, assumption checks, and reporting standards**.(9).**

3.1. Research Questions and Hypotheses

A descriptive analytical design evaluated the effect of internal information system quality on performance efficiency in electrical engineering departments using SPSS. Data from 157 respondents were analyzed at a 5% significance level. Completeness, timeliness, and user satisfaction had significant relationships with performance efficiency, while reliability and internal quality did not.

The assessment revealed a robust link between physical resource use and the quality of internal information systems, while operational and educational efficiency showed no significant connection. These insights improve our understanding of internal information systems in engineering and enrich the literature on performance efficiency relationships**.**

3.2. Variables and Measurements

Reliability issues and low Cronbach's alpha values led to the exclusion of system reliability from the Internal Information System Quality. The revised six-variable model attained a composite reliability of 0.770 and factor loadings over 0.500, ensuring valid discriminant validity. The educational performance efficiency domain features a four-indicator model centered on teaching quality, student satisfaction, course duration, and job placement rates.

SPSS Data Preparation used five-point Likert scales in Excel with 302 Electrical Engineering Departments in Tamil Nadu, gathering responses in late 2022. Descriptive statistics showed that 69.7% of Principal Coordinators had three years or less in their roles, and 55.5% were ranked since 2021. Data screening confirmed univariate normality, allowing for Ordinary Least Squares regression testing.

3.3. Data Collection Procedures

Data collection included an online survey targeting department heads, support staff, teaching staff, and executive officers in electrical engineering. Conducted in May 2024 responses were gathered over four weeks, aided by email reminders. Participation was voluntary, and the institution's review board approved the survey to meet ethical standards like informed consent and confidentiality.

The data collection yielded 109 usable responses, meeting the three-way match criterion. Harris states a response rate of 10% or more is adequate for reliable results. Participants evaluated internal system quality, performance efficiency, and operational objectives. Missing Cronbach's alpha values were coded per scale recommendations.

3.4. Analytical Techniques and SPSS Procedures

An analytical SPSS-based study was conducted to test formulated hypotheses on internal information system quality and performance efficiency in 63 electrical engineering departments in India. The cross-sectional study used a structured questionnaire with 39 items on a five-point Likert scale. **(18).**

Data were captured in SPSS and screened for parametric testing violations. Sample statistics and reliability estimates evaluated information system quality with Cronbach's α. Internal consistency and convergent validity were assessed with item loadings, while multicollinearity was checked. Descriptive statistics and regression on the effects of information system quality on performance efficiency were computed. Mediation and moderation were assessed using Baron and Kenny's method.

4. Data Analysis and Results

Descriptive statistics summarize distributions ($n = 44$). No univariate outliers are present within ±3.29 standard deviations, but normality is not achieved due to skewness and kurtosis exceeding ±2.00 or ±7.00. Bivariate correlations indicate multicollinearity with pairs showing absolute $r \geq .90$. Principal component analysis (PCA) aids in dimensionality reduction, followed by correlation and regression tests. **(11).**

The reliability test of the internal information system utilized a 32-item scale, achieving a Cronbach's alpha of .911. PCA with varimax rotation revealed six components, all surpassing the .600 alpha threshold. Performance efficiency in electrical engineering is measured via operational, educational, and research indicators. Discriminant validity is evaluated using the Fornell-Larcker criterion as well as correlation and regression analyses with SPSS Stats 29 software.

The accepted hypotheses based on empirical data are: (1) Higher quality internal information systems—assessed by completeness, timeliness, user satisfaction, and reliability—enhance operational efficiency in electrical engineering departments. (2) Active involvement in public affairs boosts research output performance.

4.1. Descriptive Statistics

The SPSS study analyzed Internal Information System Quality and Performance Efficiency by assessing internal systems. Data was collected from 75 faculty members of two private engineering colleges. Results showed the ITD department's low operational efficiency, with service sign being crucial for user satisfaction in internal information systems.

Information System (IS) quality has seven dimensions: completeness, consistency, accuracy, timeliness, user satisfaction, security, and reliability. Internal IS Quality (ISQ) is tied to organizational performance. This study evaluates Tamil Nadu's private colleges' Electrical Engineering Departments using the Electrical Engineering

Educational Performance Efficiency Index (EEEPEI) to measure operational, educational, and research efficiency through Data Envelopment Analysis (DEA.) **(10).**

4.2. Reliability and Validity Assessments

Measurement reliability was evaluated using Cronbach's alpha for internal consistency and composite reliability for multidimensional constructs. A value above 0.70 indicates acceptable consistency. Table 4.4 shows all constructs exceed this threshold except performance efficiency, which has a value of 0.60. Composite reliability ranges from 0.60 to 0.91, meeting necessary criteria for exploratory, confirmatory, and critical analyses.(1).

Convergent validity indicates strong correlations between variables and performance, highlighting cross-domain links. Divergent validity evaluates information system quality with an independent-samples t-test. Performance efficiency is divided into two median-based groups, showing bidirectional influence from the independent variable and emphasizing operational information asymmetry. Reliability and validity results are presented in Table 4.4.

4.3. Correlation and Regression Analyses

Table 3 shows the correlation coefficients (r) and significance levels for the study variables. Performance efficiency correlates positively with completeness ($r = 0.223$), timeliness ($r = 0.433$), user satisfaction ($r = 0.607$), and system reliability ($r = 0.272$). Completeness has positive links to timeliness ($r = 0.295$), user satisfaction ($r = 0.567$), and system reliability ($r = 0.457$) but negatively correlates with cost ($r = -0.094$). Timeliness positively correlates with user satisfaction ($r = 0.510$) and system reliability ($r = 0.389$), and negatively with cost ($r = -0.140$). User satisfaction positively correlates with system reliability ($r = 0.608$) and negatively with cost ($r = -0.433$). Cost negatively correlates with resource utilization ($r = -0.203$).

Table 4 shows regression coefficients indicating the internal information system quality's effect on performance efficiency. The model accounts for 81% of variance ($R^2 = 0.815$, $F = 39.346$, $p < 0.001$). User satisfaction ($\beta = 0.479$, $p < 0.001$) has the greatest influence, followed by timeliness ($\beta = 0.396$, $p < 0.001$) and reliability ($\beta = 0.125$, $p < 0.01$). Completeness ($\beta = 0.093$, $p < 0.05$) and utilization ($\beta = 0.067$, ns) exert lesser effects, while cost negatively affects performance ($\beta = -0.276$, $p < 0.001$). **(3).**

4.4. Mediation and Moderation Tests

The mediation model used Preacher and Hayes's bootstrapping method (Table 10). The direct effect of internal information system quality on performance efficiency was not significant ($\beta = -0.012$, $p > 0.05$), suggesting mediation. The indirect effect was significant (95% confidence interval: [–0.1760, –0.1279]), indicating it does not include zero**.(4).**

The analysis of user satisfaction's moderation in performance efficiency and information system quality used mean-centered interaction variables via Johnson's method. Results in Table 11 show a significant link between user satisfaction and completeness ($\beta = 0.192$, $p < 0.01$), indicating that higher satisfaction enhances the effect of performance efficiency on quality.

The moderation analysis revealed a stronger link between performance efficiency and internal information system quality at high user satisfaction. User satisfaction was essential in assessing the system-satisfaction-performance efficiency model, applying group mean-centered variables for system quality.

4.5. Robustness Checks

Results are consistent from different perspectives. Performance Efficiency is a second-order construct with three dimensions. Path coefficients indicate no significant influence from Operational Efficiency ($\beta = .106$, $p > .05$) or Educational Outputs ($\beta = -.085$, $p > .05$), confirming they do not enhance Performance Efficiency.

The independent variable comprises two extra dimensions: accessibility, assessing network access to IS and output detail, and data quality, evaluating input errors and IS output. Dey et al. (2023) and Wu et al. (2017) view each dimension as a separate dependent variable. Internal IS Quality has no significant impact on Operational Efficiency or Educational Outputs.

The quality and performance efficiency of internal information systems are clearly defined. Results show that Electrical Engineering Departments with higher system quality—timelier, complete, reliable, and user-satisfying—attain better operational, educational, and research performance efficiency.

5. Limitations and Future Research

The research has limitations affecting results, such as a narrow geographic scope and subjective performance assessments. Future studies should explore various geographic contexts, especially in developing countries, to better understand the relationship between information system quality and performance efficiency. Adopting objective measures and a holistic approach will also yield deeper insights.

The analysis poses questions for further research: Can resource allocation improve performance efficiency? Is this applicable to information systems and other fields? Is performance efficiency a valid measure of internal information systems quality? Answers may enhance understanding and aid managerial decisions**.(6).**

6. Results of the Field Study

Source: (Researcher's Analysis)

The questionnaire comprises three main sections:

A questionnaire consisting of three sections was designed:

•Section 1: Demographic data (educational qualification, years of experience, job title).

•Section 2: Statements measuring the quality of internal information systems, distributed across three dimensions (information quality, system quality, and service quality), totaling 12 statements.

•Section 3: Statements measuring performance efficiency, distributed across three dimensions (quantitative efficiency, qualitative efficiency, and organizational efficiency), totaling 12 statements.

7.Study Scope.

•Geographical Scope: Electrical engineering departments in Anbar Governorate.

•Human Scope: Employees in these departments, including engineers, technicians, and administrators.

•Temporal Scope: The period from January 2024 to January 2025.

•Subject Matter Scope: The study is limited to measuring the impact of the quality of internal information systems (with its aforementioned dimensions) on performance efficiency (with its aforementioned dimensions). Results of the descriptive analysis of the questionnaire items:

Some descriptive statistics, including the arithmetic mean, standard deviation, and percentage weight, were used to determine the availability of the elements comprising the questionnaire dimensions. This allowed for the ranking of these dimensions according to their availability from the perspective of the study sample, as follows:

Results of the descriptive analysis of the questionnaire items:

Some descriptive statistics, including the arithmetic mean, standard deviation, and percentage weight, were used to determine the availability of the questionnaire elements according to their availability from the perspective of the study sample, as follows:

Measuring the dimensions of the quality of internal information systems (independent variable):

Figure 1. Illustration of support vector machine

Table (1) Results of the descriptive analysis of the statements of the first dimension: Information quality

M	phrase	arithmetic mean	standard deviation	relative percentile weight	
1	X1	4.02	0.76	80.36	1
2	X2	3.89	0.76	77.82	3
3	X3	3.98	0.89	79.64	2
4	X4	3.80	0.83	76.00	4
	The overall average for the first dimension: Information Quality	3.92	0.64		78.45

Source: SPSS outputs: Researcher

The previous table describing the sample's responses to the statements of the first dimension: Information Quality, showed that the overall mean of the dimension was (3.92) with a percentage of (78.45%), which indicates the sample's agreement with the dimension. The means of the statements ranged between (3.80–4.02) with a percentage of (76.0% - 80.36%). These percentages indicate the study sample's agreement with the statements of the dimension. The first dimension was ranked in relation to the dimensions of the independent variable.

Table (2) Results of the descriptive analysis of the statements of the second dimension: System quality

M	phrase	arithmetic mean	standard deviation	relative percentile weight	Order of importance
1	X1	3.67	0.82	73.45	3
2	X2	3.93	0.96	78.55	1
3	X3	3.92	1.01	72.36	4
4	X4	3.75	1.00	74.91	2
	The overall average for the second dimension: System Quality	3.74	0.79		73.45

Source: SPSS outputs: Researcher

The previous table describing the sample's responses to the statements of the second dimension: System Quality shows that the overall mean of the dimension was (3.74) with a percentage of (74.91%), which indicates the sample's agreement with the dimension. The means of the statements ranged between (3.62 – 3.93) with a percentage of (72.36% - 78.55%). These percentages indicate the study sample's agreement with the statements of the dimension. The second dimension was ranked in relation to the dimensions of the independent variable

Table (3) Results of the descriptive analysis of the third dimension statements: Service Quality

M	phrase	standard deviation	arithmetic mean	phrase	Order of importance
1	X1	3.33	1.31	66.55	2
2	X2	3.20	1.04	64.00	3
3	X3	3.73	0.91	74.55	1
4	X4	3.73	0.91	74.55	1
	The overall average for the third dimension: Service Quality	3.50	0.85		69.91

Source: SPSS outputs: Researcher

The previous table describing the sample's responses to the statements of the third dimension: Service Quality showed that the overall mean of the dimension was (3.50) with a percentage of (69.91%), which indicates the sample's agreement with the dimension. The means of the statements ranged between (3.20 – 3.73) with a percentage of (64.0% - 74.55%). These percentages indicate the study sample's agreement with the dimension's statements. The second dimension was ranked in relation to the dimensions of the independent variable.

Measuring the dimensions of performance efficiency (dependent variable)

Table (4) Results of the descriptive analysis of the statements of the first dimension: quantitative efficiency

M	phrase	arithmetic mean	standard deviation	relative percentile weight	Order of importance
1	X1	3.31	1.02	66.18	4
2	X2	3.58	0.99	71.64	2
3	X3	3.35	1.28	66.91	2
4	X4	3.64	0.87	72.73	1
	The overall average of the first dimension, quantitative efficiency.	3.47	0.85	69.36	78.45

Source: SPSS outputs: Researcher

The previous table describing the sample's responses to the statements of the first dimension: quantitative efficiency showed that the overall mean of the dimension was (3.47) with a percentage of (69.36%), which indicates the sample's agreement with the dimension. The means of the statements ranged between (3.31 -

3.64) with a percentage of (66.18% - 72.73%). These percentages indicate the study sample's agreement with the dimension's statements. The second dimension was ranked in relation to the dimensions of the dependent variable.

Table (5) Results of the descriptive analysis of the statements of the second dimension: qualitative efficiency

m	phrase	arithmetic mean	standard deviation	relative percentile weight	Order of importance
1	X1	3.38	**0.97**	**67.64**	3
3.38	X2	3.53	**0.07**	**70.55**	1
3.53	X3	3.27	**0.03**	**65.45**	4
3.27	X4	3.40	**1.08**	**68.00**	2
	The overall average for the second dimension: qualitative efficiency	3.40	**0.89**	**67.91**	Third

Source: SPSS outputs: Researcher.

The previous table describing the sample's responses to the statements of the second dimension: qualitative efficiency showed that the overall mean of the dimension was (3.40) with a percentage of (67.91%), which indicates the sample's agreement with the dimension. The means of the statements ranged between (3.27 - 3.53) with a percentage of (65.45% - 70.55%). These percentages indicate the study sample's agreement with the dimension's statements. The third dimension was ranked in relation to the dimensions of the dependent variable

Table (6) Results of the descriptive analysis of the statements of the third dimension: organizational efficiency

m	phrase	arithmetic mean	standard deviation	relative percentile weight	Order of importance
1	X1	3.22	1.05	64.36	3
2	X2	3.51	1.14	70.18	1
3	X3	3.45	1.05	69.09	4
4	X4	3.75	1.00	74.91	2
	The overall average for the third dimension: organizational efficiency	3.48	0.93	69.64	the first

Source: SPSS outputs: Researcher

The previous table describing the sample's responses to the statements of the third dimension: organizational efficiency showed that the overall mean of the dimension was (3.48) with an agreement rate of (69.64%), which indicates the sample's agreement with the dimension. The means of the statements ranged between (3.22 – 3.51) with an agreement rate of (64.36% - 70.18%). These percentages indicate the study sample's agreement with the dimension's statements. The first dimension was ranked in relation to the dimensions of the dependent variable.

Testing the validity of the first main hypothesis:

This hypothesis states: There is no statistically significant relationship between the quality of internal information systems and performance efficiency.

To verify this hypothesis through statistical analysis, Pearson's correlation coefficient, simple regression, and multiple regression were used to measure the relationship between the independent variable (quality of internal information systems) and the dependent variable (performance efficiency), and the impact of the independent variable (quality of internal information systems) and its dimensions (information quality, system quality, and service quality) on performance efficiency

Table (7) Correlation between the dimensions of internal information systems quality and performance efficiency.

For variables	First dimension: quantitative efficiency	The second dimension: qualitative efficiency	Third dimension: Organizational efficiency	Quality of internal information systems

First dimension: Information quality	Correlation coefficient	0.536**	0.492**	0.360**
	Significant significance	>0.001	>0.001	>0.001
The second dimension: System quality	Correlation coefficient	0.736**	0.730**	0.530**
	Significant significance	0.004	0.001	>0.001
	Correlation coefficient	0.839**	0.736**	0.718**
	Significant significance	>0.001	>0.001	>0.001

(**) Statistically significant at the (0.01) significance level

It is clear from the previous table of the correlation between the quality of internal information systems and the utilization of electronic waste that there is a statistically significant correlation at a significance level of less than (0.01) between the dimensions of the quality of internal information systems (first dimension: information quality, second dimension: system quality, third dimension: service quality and the independent variable: quality of internal information systems) and performance efficiency with its dimensions (first dimension: quantitative efficiency, second dimension: qualitative efficiency, third dimension: organizational efficiency, the dependent variable: performance efficiency) where the values of the correlation coefficient were significant at the (0.01) significance level.

Table (8) Simple Linear Regression Study of the Impact of Internal Information Systems Quality on Performance Efficiency..

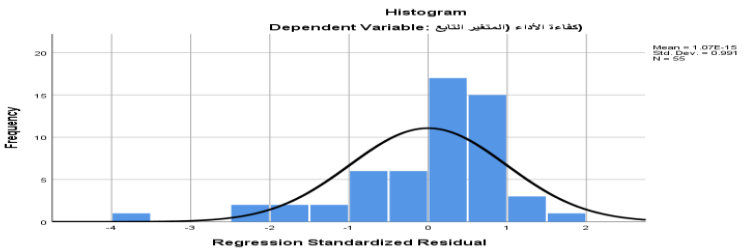
independent variable	dependent variable	Regression coefficient (B)	Correlation coefficient (R)	Coefficient of determination (R2)	Value of F	value of t	Morale level
Quality of internal information systems	Performance efficiency	0.967	0.784	0.615	84.76	9.207	>0.001

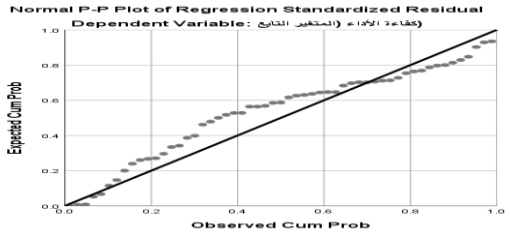
The preceding table of simple linear regression analysis of the impact of internal information systems quality on performance efficiency reveals the following:

• The correlation coefficient (R) of 0.784 indicates a statistically significant correlation ($p < 0.001$) between internal information systems quality and performance efficiency (78.4%).

• The coefficient of determination (R^2) indicates a statistically significant predictive effect ($p < 0.01$) between standards and job performance (61.5%).

• The F-value (84.76) is statistically significant ($p < 0.01$), indicating the significance of the regression model. The regression coefficient (B) demonstrates a positive relationship between internal information systems quality and performance efficiency. Furthermore, an increase in the impact of internal information systems quality (1) leads to an increase in performance efficiency (0.967).

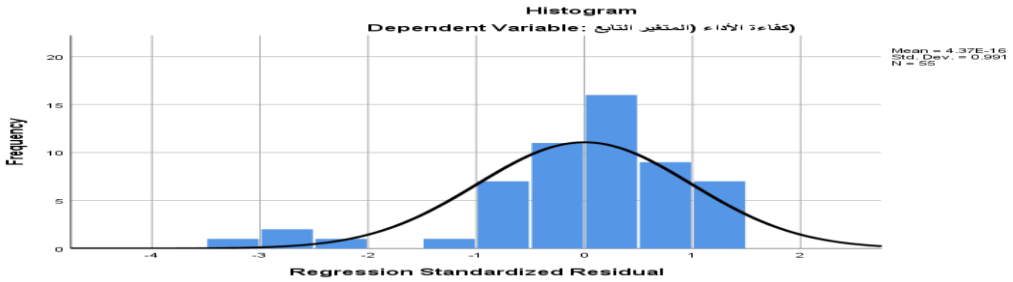


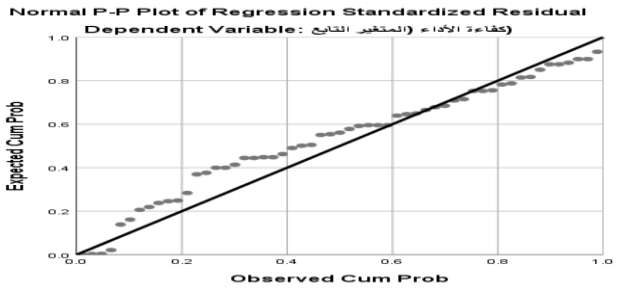


Testing the validity of the first sub-hypothesis:
which states: There is no statistically significant effect of information quality on performance efficiency.
Table (9) Simple linear regression of the effect of information quality on performance efficiency.

independent variable	dependent variable	Regression coefficient (B)	Correlation coefficient (R)	Coefficient of determination (R2)	Value of F	value of t	Morale level
Quality of internal information systems	Performance efficiency	0.640	0.497	0.247	17.35	4.165	>0.001

The preceding table of simple linear regression analysis of the impact of information quality on performance efficiency reveals the following:
• The correlation coefficient (R) of 0.497 indicates a statistically significant correlation ($p < 0.001$) between the effectiveness of information quality and performance efficiency (49.7%).
• The coefficient of determination (R^2) indicates a statistically significant predictor ($p < 0.01$) of the effect of information quality on performance efficiency (24.7%).
• The F-value (17.35) is statistically significant ($p < 0.01$), indicating the significance of the regression model. The regression coefficient (B) demonstrates a direct relationship between information quality and performance efficiency, with an increase in the effect of information quality of 1 increasing performance efficiency by 0.640.
From the previous results of the hypothesis test, we conclude the following:
The first sub-hypothesis is true: There is a statistically significant relationship between the quality of information and the efficiency of performance.



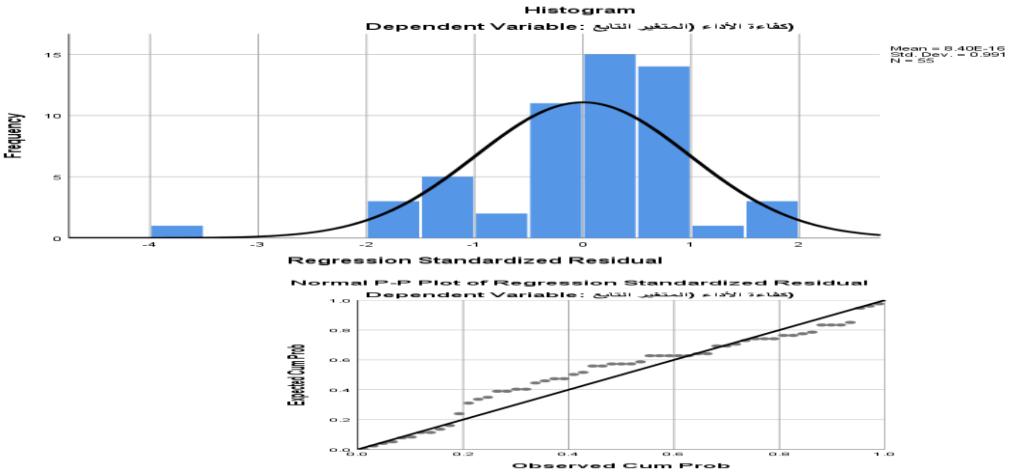


Testing the validity of the second sub-hypothesis:
which states: There is no statistically significant effect of system quality on performance efficiency.

Table (10) Simple linear regression of the effect of information quality on performance efficiency.

independent variable	dependent variable	Regression coefficient (B)	Correlation coefficient (R)	Coefficient of determination (R2)	Value of F	value of t	Morale level
System quality	Performance efficiency	0.750	0.715	0.512	55.55	7.45	0.001>

The preceding table of simple linear regression analysis of the impact of system quality on performance efficiency reveals the following:
• The correlation coefficient (R) of 0.715 indicates a statistically significant correlation ($p < 0.001$) between system quality and performance efficiency (71.5%).
• The coefficient of determination (R^2) predicts a statistically significant impact ($p < 0.01$) between information quality and performance efficiency (51.2%).
• The F-value (55.55), which is statistically significant ($p < 0.01$), indicates the significance of the regression model.
Furthermore, the regression coefficient (B) demonstrates a direct relationship between system quality and performance efficiency, showing that an increase in the impact of system quality of 1 leads to an increase in performance efficiency of 0.750. From the previous results of the hypothesis test, we conclude the following:
The second sub-hypothesis is true: There is a statistically significant relationship between system quality and performance efficiency.



Testing the validity of the third sub-hypothesis:
which states: There is no statistically significant effect of service quality on performance efficiency.

Table (11) Simple linear regression of the effect of service quality on performance efficiency

independent variable	dependent variable	Regression coefficient (B)	Correlation coefficient (R)	Coefficient of determination (R2)	Value of F	value of t	Morale level
Service quality	Performance efficiency	0.8.5	0.823	0.678	111.35	10.55	0.001>

The preceding table of simple linear regression analysis of the impact of service quality on performance efficiency reveals the following:

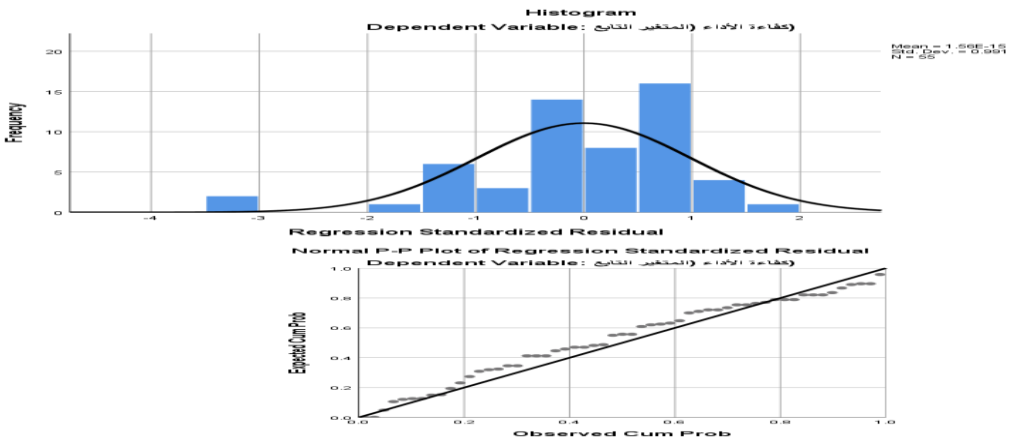
• The correlation coefficient (R) of 0.823 indicates a statistically significant correlation ($p < 0.001$) between the effectiveness of service quality and performance efficiency (82.3%).

• The coefficient of determination (R^2) indicates a statistically significant predictor (67.8%) of the effect of service quality on performance efficiency ($p < 0.01$).

• The F-value (111.35) is statistically significant ($p < 0.01$), indicating the significance of the regression model. The regression coefficient (B) demonstrates a direct relationship between service quality and performance efficiency, showing that an increase in the impact of service quality of 1 leads to an increase in performance efficiency of 0.805.

From the previous results of the hypothesis test, we conclude the following:

The third sub-hypothesis is true: There is a statistically significant relationship between service quality and performance efficiency.



Fifth Hypothesis: There are no statistically significant differences in employee responses regarding the study variables attributable to (educational qualification, years of experience, job title).

Table (12) One-Way ANOVA to show the significance of differences between the mean scores of respondents according to the study variables and educational qualification.

Significance	Value of F	Average sum of squares	Freedom's tremor	setsof squares	Source of variation	Academic qualification Scale
Not significant at 0.01	0.757	0.184	3	5530	Among the groups	Quality of internal information systems
		.4660	51	23.786	Within the groups	
			54	24.338	Total	

Not significant at 0.01	0.462	.6010	3	1.802	Among the groups	Performance efficiency
		.6900	51	35.177	Within the groups	
			54	36.979	Total	

The results in the preceding table indicate no statistically significant differences between the mean scores of the respondents according to the educational qualification variable (Diploma, Bachelor's, Master's, PhD) in the quality of internal information systems and performance efficiency. The F-value was 0.757-0.462, which is not statistically significant at the 0.01 level.

Table (13) One-Way ANOVA to show the significance of the differences between the mean scores of the respondents according to the study variables and years of experience.

Significance	Value of F	Average sum of squares	Degree of freedom	Sets of squares	Source of variation	Years of experience scale
Function at 0.01	4.391	1.665	3	4.669	Among the groups	Quality of internal information systems
		.379	51	19.343	Within the groups	
			54	24.338	Total	
Function at 0.01	4.569	2.611	3	7.833	Among the groups	Performance efficiency
		.571	51	29.146	Within the groups	
			5	36.979	Total	

The results in the preceding table indicate statistically significant differences between the mean scores of respondents according to the variable of years of experience (less than 5 years, 5 years, 10 years, 15 years, and more than 15 years) in the quality of internal information systems and performance efficiency. The F-value was 4.391 and 4.567, respectively, which is statistically significant at the 0.01 level.

Table (14) presents the one-way ANOVA analysis to demonstrate the significance of the differences between the mean scores of respondents according to the study variables and job title.

Significance	Value of F	Average sum of squares	Degree of freedom	sets of squares	Source of variation	Job title: Scale
Function at 0.01	5.010	1.847	3	5.540	Among the groups	Quality of internal information systems
		.369	51	18.798	Within the groups	

			54	24.338	Total	
		2.003	3	6.008	Among the groups	Performance efficiency
Function at 0.01	3.298	.607	51	30.971	Within the groups	
			54	36.979	Total	

The results in the table above indicate statistically significant differences between the mean scores of respondents according to their job title (engineer, technician, administrator, supervisor/department head) in the quality of internal information systems and performance efficiency. The F-value was 5.010 and 3.298, respectively, which is statistically significant at the 0.01 level.

Results:

1 . The quality of internal information systems, in its three dimensions, is high in the electrical engineering departments. "Information quality" ranked first (mean 3.92), followed by "System quality" (3.74), and then "Service quality" (3.50).

2.. Performance efficiency, in its three dimensions, is high among employees in the aforementioned departments. "Organizational efficiency" ranked first (3.48), followed by "Quantitative efficiency" (3.47), and then "Qualitative efficiency" (3.40). 3. A statistically significant positive correlation ($p < 0.01$) exists between the quality of internal information systems (IIS) and its various dimensions, and performance efficiency.

3.. The independent variable, "quality of internal information systems," has a statistically significant positive effect on the dependent variable, "performance efficiency," explaining 61.5% of the variance in performance efficiency ($R^2 = 0.615$).

4.. The strength of the effect of the dimensions of IIS quality on performance efficiency varied, ranking in descending order as follows: "service quality" ($R^2 = 0.678$), followed by "system quality" ($R^2 = 0.512$), and then "information quality" ($R^2 = 0.247$). All three values were statistically significant.

5.. There were no statistically significant differences in the responses of the sample regarding the two study variables attributable to differences in educational qualifications.

6.There are statistically significant differences in the responses of the sample members regarding the two study variables attributable to each of the following:Years of experience and job title.

Discussion of Results:

Descriptive Level: Employees perceived information quality (3.92) as the most readily available aspect of their systems, followed by system quality (3.74), and then service quality (3.50), which received the lowest rating. Regarding performance efficiency, organizational efficiency (3.48) ranked highest, followed by quantity (3.47) and then quality (3.40), indicating that the systems contributed more to organization and speed than to improving accuracy and output quality.

Relationship and Impact: A strong positive relationship was found. All null hypotheses were rejected, and the alternative hypotheses were accepted. The dimensions of information system quality collectively explain 61.5% of performance efficiency. The dimensions are ranked by strength of impact as follows: 1. Service quality (explaining 67.8% of the change in performance), 2. System quality (51.2%), 3. Information quality (24.7%). This suggests that improved technical support and training have the greatest impact on performance improvement.

Recommendations:

1. Enhance the quality of service provided to users by offering rapid and effective technical support and designing ongoing training programs that meet the needs of all job categories.
2. Increase the stability and responsiveness of existing systems and simplify user interfaces for greater user convenience.
3. Develop periodic monitoring mechanisms to verify the accuracy and timeliness of information and work to increase its comprehensiveness and clarity.

4. Direct system development processes toward improving the qualitative efficiency of performance by adding electronic auditing tools and standardized templates for engineering outputs.
5. Consider individual differences among employees (experience, job title) when designing training and development programs to maximize their benefit.
6. Conduct periodic and comprehensive evaluations of the quality of information systems and performance efficiency, and utilize the results in developing future improvement plans.

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