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**Technological Changes and Job Performance of Teachers in Higher Education
Institutions: A Study Based on Quality-accredited Colleges in Nepal**

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.Abstract

Technological change in higher education institutions refers to adopting new systems, processes, and tools to enhance learning, teaching, research, administration, and overall institutional effectiveness. This article examined how technological change is associated with teachers' job performance based on quality-accredited higher education institutions in Nepal. To conduct this study, a descriptive research design has been adopted. The population consisted of 3900 teaching faculty from 76 quality-accredited higher education institutions in Nepal. A valid sample size comprises 370 teaching faculty, which was chosen from the population using a convenience sampling method. Data collected through a five-point Likert scale structured questionnaire was used to collect the primary data. The findings revealed a positive association between technological changes and job performance of teachers, as technology adoption

simplifies tasks, saves time, and significantly boosts employee productivity. Using Information and Communication Technology (ICT) enhances teaching efficiency for educators and improves students' learning experiences. Therefore, digitizing teaching and learning methods has become essential for improving and strengthening the quality of education. However, a small association between technological changes and job performance indicated that quality-accredited higher education institutions need more technological adoption and improvement. The inferences drawn by this study will be helpful to all the stakeholders, such as the University Grant Commission Nepal, higher education institutions, teachers, and policymakers who are directly or indirectly involved in the reform of higher education.

Keywords: job performance, technological changes, HEI, QAA colleges, UGC

Introduction

Employee performance is commonly evaluated in terms of the quantity and quality of output, timeliness, attendance, work efficiency, and overall effectiveness (Mathis & Jackson, 2010). In the context of higher education, university teachers perform three core functions: teaching, research, and public service. Teaching responsibilities include lesson preparation and delivery, development of instructional materials, student assessment, supervision, consultation, and the adoption of innovative pedagogical approaches. Research responsibilities involve identifying problems, conducting investigations, presenting findings at conferences, and publishing in academic journals or textbooks, while public service extends to contributions within the institution and the wider community. Technological change refers to improvements in process efficiency for increasing output without requiring additional inputs. In contemporary organizations, technology has become integral to operations, extending beyond basic office tools and including advanced information systems, customized software, and specialized equipment that enhance efficiency and effectiveness (Heeks & Stanforth, 2015). Technological innovations minimize human effort, reduce task completion time, and in some cases eliminate the need for certain processes.

Particularly for smaller organizations, the acquisition or upgrading of technology involves high financial costs, despite its benefits, necessitating careful evaluation of expected benefits against implementation expenses (Calışkan, 2015). Substantial improvements in operational efficiency and productivity can offset initial investments over time, although such costs may delay adoption.

Several empirical studies consistently exhibit a positive association between technological change and employee performance. Abbas et al. (2014) concluded that information technology (IT) significantly reduces workload, improves control over errors and fraud, saves time, and enhances employee productivity. Similarly, Imran et al. (2014) found that technological advancement positively influences employee performance, training, and motivation. Wanza & Nkuraru (2016) further reported that technological advancement improves efficiency and effectiveness, and eases workload, while Archibong & Ibrahim (2021) confirmed that technology accelerates service delivery, reduces effort and time, and simplifies work processes.

Technological advancement has significantly improved the quality of services provided by higher education institutions (HEIs). HEIs have increasingly invested in technological resources, leading to faster task completion and reduced human effort, which positively affects employee performance (Pohekar, 2018). HEIs have transformed teaching and learning practices drastically. Easy availability of lecture videos has enabled flexible access to content, allowing classroom time to be used for interactive activities such as group work and discussions. Teaching faculties are therefore encouraged to adopt modern

instructional tools such as PowerPoint presentations and smart boards to enhance teaching effectiveness (Tamilselvi, 2017).

Both teachers and students benefit from the adoption of advanced technologies such as Learning Management Systems (LMS), Virtual Classrooms, Smart Classrooms, Artificial Intelligence (AI), Digital Assessment and Examination Systems, E-Books, and Digital Libraries. It improves content delivery, knowledge updates, enhances motivation, and facilitates communication through digital platforms. However, older staff resist technological change, highlighting the need for motivation and proper training. In general, it can be said that technological advancements improve overall organizational efficiency and productivity, as well as teachers' job performance in higher education institutions. Consequently, the current study focuses on evaluating how the technological changes impact the teachers' job performance in quality-accredited higher education institutions in Nepal.

Research Question

The researcher has tried to answer the following research question:

- To what extent are technological changes associated with the job performance of teachers in higher education institutions?

Conceptual Framework of the Study

The following conceptual framework has been framed in this study:



Research Objectives

The study aims to assess the association between technological changes and teachers' job performance in higher education institutions.

Rationale of the Study

It is widely acknowledged that the job performance of teaching faculty significantly influences the overall quality of education delivered in higher education institutions. Consequently, technological advancement significantly influences the overall job performance of teaching faculties. Therefore, understanding how technological advancement affects the job performance of teachers in QAA-certified colleges is crucial for fostering a culture of continuous improvement and improving educational outcomes.

Research Design and Methods

The descriptive survey design has been executed in this study.

Pilot study

The two subject experts examined the drafted 5-point Likert scale questionnaire for their suitability, applicability, and appropriateness of its content, i.e., content validity. Then, the questionnaire was improved as per expert advice, and the same were tested through the pilot study to ensure their comprehensibility and readability. The questionnaire

was administered to 104 teaching faculties of 3 accredited campuses, namely: Triyuga Multiple Campus (Gaighat), Janta Multiple Campus (Itahari), and J.S. Murarka Multiple Campus (Lahan). The respondents were requested to comment on the questionnaire items' content, clarity, format, and appropriateness. Before the final data collection, the questionnaire was revised based on participants' feedback to ensure translational validity, i.e., face validity. Furthermore, the reliability of the questionnaire was tested with Cronbach's alpha (α). If Cronbach's alpha (α) ≥ 0.70 , then the questionnaire items were considered reliable. The following questionnaire items met the standard value (α) of Cronbach's alpha, which is 0.7:

Table 1

Output of Reliability Test of Dependent and Independent Variables (Pilot Study)

Variables	No. of Items	Cronbach's alpha
Technological Changes	10	0.793
Job performance of teachers	15	0.868

Cronbach's alpha value of technological changes (independent variable) was 0.793 above the cut-off value of 0.7. Furthermore, Cronbach's alpha value of teachers' job performance (dependent variable) was 0.868 above the cut-off value of 0.7. So, the questionnaire was forwarded to use in the main study.

Period of the Study

The primary data for the study were collected from April 2023 to May 2023.

Population of the Study

The population consisted of all the 3,900 teachers who were working in the 76 accredited colleges in Nepal.

Sample Frame

Altogether, 13 institutions had been selected as a sample frame, which were at the top of the accreditation process. They consisted of 9 re-accredited institutions, 2 cycle-completed institutions for re-accreditation, plus 2 pre-visit completed institutions for re-accreditation.

Sampling Design

Convenience as well as quota sampling design had been executed. The researcher visited the target campuses, distributed the structured questionnaire to the available faculty, and collected the responses on the same day or the next day. A quota system was planned to select at least 30 employees from each of the 13 campuses under a sample frame.

Response Rate

A total of 424 questionnaires were distributed. 390 were received back, and 5 responses were rejected as they were incomplete. The study eliminated 15 responses from the study, 14 responses from teaching staff whose job experience was less than 2 years, of

being not deeply familiar with the institution, and 1 response (data point 48), being influencing data point that might influence analysis results negatively. So, the valid number of respondents is 370 (385-15), which is 9.5% of the universe and is an appreciable sample.

Sample Size

The simplified formula proposed by Yamane (1967) was used to calculate the sample size, which is as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where n is the sample size, N is the population size, and e is the level of precision. A 5% precision, 95% confidence level, and 0.5 (50%) degree of variability were assumed.

$$\text{Now, } n = \frac{N}{1+N(e)^2} = \frac{3900}{1+3900(0.05)^2} = 362.79$$

Furthermore, the sample size can be determined by using the published table. Israel (1992) presented the table for the determination of sample size. According to the table, if the size of the population is 4000, then the appropriate sample size is 364 at a 5% precision level, 95 % confidence level, and 0.5 (50%) degree of variability. So, the sample size, which consisted of 370 respondents, was appropriate.

Data management

The received questionnaires were coded and entered into SPSS 20. Subsequently, the data were examined for any missing values; they were minimal and randomly distributed. Hair et al. (1998) stated that if the missing values are limited and occur completely at random, then any omissions are considered a secondary concern. So, any absent data were considered as a secondary concern. The mean value of the scale was substituted in place of the missing value to minimize the difficulties in the analysis of the data, which is a frequently utilized method for handling missing data (Egan et al., 2004). As per ethical considerations, the confidentiality and anonymity of the respondents have been ensured.

Questionnaire Design: Scaling Technique in the Questionnaire

The questionnaire had three parts: (a) objectives of the study and instructions for the respondents, (b) demographic variables, and (c) a 5-point Likert scale questionnaire related to the main variables in the order as follows:

1-Strongly Disagree, 2-Disagree, 3-Undecided, 4-Agree, and 5-Strongly Agree.

Measurement of Job Performance of Teachers

Evaluation of job performance for teachers in higher education institutions often involves a combination of methods, such as student evaluations, peer assessments, self-assessments, classroom observations, and assessment of scholarly outputs.

Regarding the present study, the job performance of the teachers was measured through self-assessment by the teachers themselves using a 5-point Likert scale questionnaire.

Data analysis tools

The association of technological changes (independent variable) with the job performance of teachers (dependent variable) was tested with the Pearson correlation test. Table 2 presents the rule of thumb for interpreting the value of the Correlation Coefficient.

Table 2.
Rules of thumb for the range of the correlation coefficient

Coefficient Range	Strength of Association
± 0.00 to ± 0.20	Slight, almost negligible
± 0.21 to ± 0.40	A small but definite relationship
± 0.41 to ± 0.70	Moderate
± 0.71 to ± 0.90	Strong
± 0.91 to ± 1.00	Very strong

Furthermore, the relationship between technological changes (independent variable) and the job performance of teachers (dependent variable) was determined with the help of simple regression analysis. The regression model for the study is as follows: $PoT = \alpha + \beta (TC) + \varepsilon$... (1) Where, PoT = Job performance of Teachers; α = Intercept Line; and β = Regression Line, TC = Technological Changes; ε = Error Term.

Results and Discussion

Descriptive Statistics

Descriptive statistics such as mean, standard deviation, skewness, maximum, and minimum were used to establish the central tendency and measure of dispersion of key variables. Both the variables were negatively skewed with varying degrees of skewness.

Table 3
Internal Consistency, Correlation Coefficient, and Descriptive Statistics of Summated Scales

Factors	No. of Items	Reliability	Correlation coefficient with job performance	Mean Statistic	Std. Deviation Statistic	Skewness Statistic	Std. Error	Minimum Statistic	Maximum Statistic
Technological changes	10	0.849	0.392**	18.2135	4.17508	-0.775	0.127	5	25
Job performance	15	0.861	-	58.4432	8.11892	-1.111	0.127	23	75

**Correlation is significant at the 0.01 level (2-tailed). Valid N (listwise): 370

Reliability of Questionnaire

Cronbach's alpha coefficient was used to test the internal consistency of the research instrument. If $\alpha \geq 0.70$, then the items were considered reliable. As presented in Table 3, Cronbach's alpha value of technological changes (independent variable) was 0.849, which was above the cut-off value of 0.7. Furthermore, Cronbach's alpha value of job performance of teachers (dependent variable) was 0.861, which was above the cut-off value of 0.7.

Validity of Questionnaire

Pearson's correlation coefficient (r) was used to establish criterion validity. The critical value of Pearson's correlation coefficient at a 0.05 significance level for a two-tailed test, with 368 degrees of freedom (N -2), was determined to be 0.10197. The criterion validity of the questionnaire is established when each item in the questionnaire exhibits a correlation higher than the critical value. Here, calculated correlation coefficients of all the questionnaire items exceeded the critical value, 0.10197. So, the criterion validity of the questionnaire is established.

Table 4*Pearson's Correlation Analysis for Validity of Items*

Variable	Items																										
	TC_1	TC_2	TC_3	TC_4	TC_5	TC_6	TC_7	TC_8	TC_9	TC_10	PoT_1	PoT_2	PoT_3	PoT_4	PoT_5	PoT_6	PoT_7	PoT_8	PoT_9	PoT_10	PoT_11	PoT_12	PoT_13	PoT_14	PoT_15		
Technological changes																											
Pearson's correlation coefficient (r)	.81**	.76**	.73**	.77**	.54**	.49**	.39**	.49**	.41**	.7**																	
Validity criterion met	Yes																										
Job performance																											
Pearson's correlation coefficient (r)	.6**	.69**	.64**	.67**	.7**	.73**	.61**	.69**	.52**	.45**	.65**	.63**	.27**	.55**	.52**												
Validity criterion met	Yes																										

**Correlation is significant at the 0.01 level (2-tailed).

Valid N (listwise): 370

Assessment of Normality Assumption

The two tests of normality consistently rejected the assumption of normality as can be seen in Table 5:

Table 5*Kolmogorov-Smirnov & Shapiro-Wilk Tests of Normality*

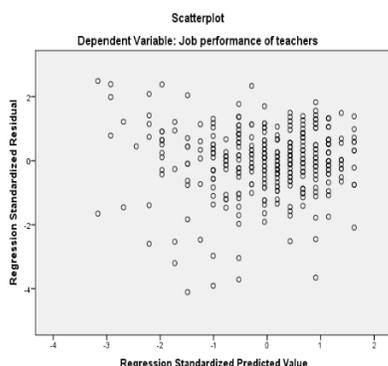
	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Standardized Residual	0.096	370	0.000	0.954	370	0.000

Assessment of Homoscedasticity Assumption

The homoscedasticity assumption of the data was checked with the visual display of scatterplot of standardized residuals against standardized predicted values.

Figure 1

Scatter Plot of Standardized Residuals against Standardized Predicted Values



The distributional pattern of standardized residuals against standardized predicted values was random. This suggested that there was no evidence against the assumption of homogeneity of error terms.

Assessment of Outlying Observation

The source of outlying observations in residuals is due to either a dependent variable or an independent variable. The assessment of outlying observations due to the dependent variable (aka outliers) is carried out by assessing the studentized deleted residuals. The assessment of outlying observations due to independent variables (aka high leverage points) is carried out by assessing the centered leverage statistics. SPSS provides various statistics of residuals, centered leverage values, and Cook's distance under the table Residuals Statistics. The edited version of residual statistics is presented in Table 6.

Table 6

Residual Statistics (Edited)

	Minimum	Maximum	Mean	Std. Deviation	N
Standardized Residual	-4.106	2.492	0.000	0.999	370
Studentized Deleted Residual	-4.217	2.549	-0.001	1.008	370
Cook's Distance	0.000	0.098	0.004	0.011	370
Centered Leverage Value	0.000	0.027	0.003	0.004	370

The following points and conclusions that emerged:

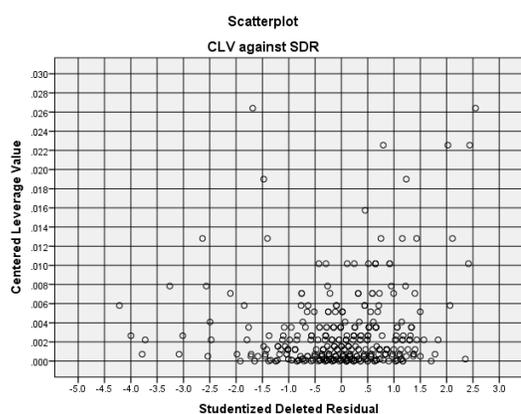
- The minimum value of the studentized deleted residual was -4.217, and its absolute value was greater than 3. According to a rule of thumb, at least one outlier was present in the model.

- The maximum centered leverage value was 0.027, greater than 0.0081 ($3k/n = 3/370$). According to a rule of thumb, at least one unusual value that could be considered a high leverage point is present in the data.

In order to have a broad picture of outlying observations, it is a good idea to construct and present the scatter plot of centered leverage values against the studentized deleted residuals. The scatter plot and some remarks are presented in Figure 2.

Figure 2

Scatterplot of centered Leverage Value against Studentized Deleted Residual



Few centered leverage values were higher than 0.0081($3k/n$), and each of them, by a rule of thumb, could be considered as high leverage points, but their corresponding studentized residual values are within the range of -3 to 3. As a result, they might not have undue influence on the model. Few absolute values of studentized deleted residuals were more than 3, and each of them, by a rule of thumb, can be considered as outliers, but their corresponding centered leverage values are less than 0.0081($3k/n$). As a result, they may not have undue influence on the model. All the high leverage values, as well as outliers present in the model, were not influential points (data points that may not change the results of regression analysis), since the maximum value of Cook distance was 0.0098, which was far below the value of 1.

Correlation of Technological Changes with Teachers' Job Performance

The Pearson correlation coefficient was computed to assess the association between technological changes (independent variable) and the teachers' job performance (dependent variable). The correlation between technological changes and the teachers' job performance was positive and significant, $r(368) = 0.392$, $p = 0.000$ (as per Table 3). The Pearson correlation coefficient value (r-value), 0.392, lay within the coefficient range from + 0.21 to + 0.40. So, a small but definite relationship existed between technological changes and the job performance of teachers.

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The result is in line with the findings of other studies, such as Timalcina (2022), $r = 0.825$; Archibong & Ibrahim (2021), $r = 0.428$; Osunsan et al. (2019), $r = 0.717$; and Al-Jaradat et al. (2013), $r = 0.648$.

Regression Analysis

The relationship between technological change and the teachers' job performance was determined by executing a simple linear regression analysis.

Table 7

Impact of technological changes on job performance

Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	β	Std. Error	Beta		
(Constant)	44.551	1.742		25.570	.000
TC	0.763	0.093	0.392	8.18	.000
R	0.392				
R ²	0.154				
Adjusted R ²	0.152				
F-Value	66.907	(p=0.000)			

Table 7 revealed that technological changes had a significant and positive relationship with the teachers' job performance, $\beta = 0.763$, $t(368) = 8.18$, $p < 0.01$. Technological changes also explained a significant proportion of variance in the teachers' job performance, $R^2 = 0.154$, $F(1,368) = 66.907$, $p < 0.01$.

The result was in line with the findings of other studies, such as Timalcina (2022), $\beta = 0.426$; Archibong & Ibrahim (2021), $\beta = 2.151$; and Osunsan et al. (2019), $\beta = 0.7$. But the result was not in line with the findings of Ekechi & Umar (2020), $\beta = -0.205$.

Conclusion

Technology makes tasks easier, and so the use of technology greatly escalates employee performance. It boosts employee productivity by saving time. Learning Management System (LMS), Virtual Classrooms, Smart Classrooms, Artificial Intelligence (AI), Digital Assessment and Examination Systems, E-Books, and Digital Libraries help students learn more effectively, as well as support teachers in delivering lessons more effectively. Therefore, it is essential to adopt advanced technology and digitize teaching and learning methods to improve and elevate the quality of education. However, technological advancement in quality-accredited higher educational institutions in Nepal was small.

Implications

Here are some potential implications of such a study:

- **Incorporating Technological Advancements:** This study may encourage HEIs to invest in relevant educational technologies and train the teachers, enabling them to leverage technology effectively in their teaching.
- **Enhanced Student Learning:** This study may encourage HEIs to Institutions to create a technology-rich learning environment that enables teachers to engage students in innovative and interactive ways, leading to improved academic achievements.
- **Quality Assurance and Accreditation:** This study suggest University Grant Commission (UGC) and other accreditation bodies consider technology integration as a component of institutional quality assessment.

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