

statistical analysis to evaluate the impact of technological innovation on organizational innovation and organizational performance

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## **Statistical analysis to evaluate the impact of technological innovation On organizational innovation and organizational performance**

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### **Abstract:**

This study investigated the impact of technological innovation on organizational innovation and organizational performance. The study aimed to determine the relationship between technological innovation, organizational innovation, and organizational performance in organizations from Kurdistan. The study used survey research. The primary data with the questionnaire were used as a research tool. The three hypotheses formulated for this study were tested using correlation, regression analysis, Pearson's correlation, and analysis of variance (ANOVA), with the help of a statistical package for the social sciences (SPSS) version 25. Analysis of the study revealed that technological innovation has a significant positive impact on both organizational performance and organizational innovation. Additionally, organizational innovation has a significant positive impact on organizational performance.

**Keywords:** Technological Innovation, organizational innovation, organizational performance, Simple Regression, Analysis of variance.

### **1. Introduction:**

Technology is one of the basic and most important elements connected to effective operations management in an organization. It can be defined as a set of knowledge that is used to create tools, develop skills, and extract or collect materials. Technology increases the possibility of doing business in more competent and competitive ways that constantly differ from the past. (shoeb ahmed , 2014).

Successor failure any organization in the world to relies mainly on technology and on how an organization adapts to innovation, and welcome to innovation especially technological innovation in the best manner for improved performance, which in turn to improve organizational innovation and

organizational performance. The result of this business which in turn leads to an increase in production and the ability to continuous improvement of the quality of goods and services offered.

The business environment has become a dynamic and progressively complex and changeable environment (Davoudi et al., 2012; Coopers, 1997; Shcherbakov et al., 2017), where changing technology, globalization, knowledge, and competitive approaches affect complete performance (Hitt et al., 2001; Scott, 2000). Change is the reason behind many company's searches for new ways to manage the business of wealth making (Stopford, 2001).

Technological development cannot be devoid of innovation. The institution must change the way they work and also change the products and services offered. It may not be growth through innovations necessarily through innovations hacks. To be sure, improvement because of innovations cannot be the result of modern inventions is very happening. It is, however, to get the best results, including additional new ways to accommodate current technologies or advanced ones. (wahlen, 2007).

In this paper, we are going to examine the role of technological innovation on organizational innovation and organizational performance. The main objective of this study is to examine the aspect of technology in organizations generally. We make and illustrate the importance of promoting innovation within organizations, especially aspect of performance. Technological innovation is the best factor for increasing organizational innovation and organizational performance.

## **2. Literature review:**

The literature review is organized according to the three basic constructs of the research: technological innovation, organizational innovation, and organizational performance.

### **2.1 Technological innovation:**

Innovation refers to the adoption of an idea, behavior, system, policy, program or device, a process, product, or service that is new to the organization (Damanpour, 1991). Extended the definition of innovation in the Oslo Manual (OCDE, 2005) is organizational innovation other than technological innovation.

Relations between the organizational and technological innovations studies often Highpoint that technological innovation is leading the organizational changes within the company (Dougherty, 1992) because the companies that offer technological innovation must reorganize Production, employment, sales, and distribution systems. Another stream of research indicates the presence of an Inverse relationship, such as to improve organizational flexibility innovation, and creativity, which facilitate the development of technological innovations (Lokshin et al., 2008).

Another argument in the literature of technological advances wondering whether those companies' Attractive new forms of benefit take advantage of the radical changes in technology depends on Product Innovation, (Dougherty's, 1992) Model Deals, fairs, and knows how to connect them to the market with trade the possibilities, where the investment strategy and organizational design in the context of inseparably linked. This relationship between your trust and our understanding of the effects of regulation Based on

statistical analysis to evaluate the impact of technological innovation on organizational innovation and organizational performance

the ability of organizations to learn and create knowledge and technology generation the research mark (Lam, 2005), as well as the relationship between the institution and Technological innovations (Günday et al., 2011).

Technological innovation is the best way to achieve organizational goals and is also important to increase competitive advantage. If you want your business to differ from another organization is necessary to change with innovation and adapt your organization overall with technological innovation because the only way to attain your objectives in the best manner.

Technological innovation also impacts to offered services and goods, organizations can focus and adapt to technological innovation improvement always renew themselves and make a difference with their competitors in quality or price.

## **2.2 Organizational innovation:**

Innovation involves the adoption of new products or processes to increase competitiveness and overall profitability. It includes new ways to identify new customer needs and current (Rogers, 1995). Innovation is one of the main challenges of corporate governance. (Hitt et al., 2001) showed that innovation is essential for companies to compete in national and global markets.

Conceptually, organizational innovation is a comprehensive concept that includes strategic, structural, and behavioral dimensions; however, there is no consensus on its definition. Some studies include all types of innovation under their umbrella (Daft 1978; Crossan et al., 2010). Organizational innovations often explain changes in business practices (and knowledge management) in the organization of the workplace or the external relations of the company.

Several authors (Tidd et al., 2005) have considered innovation to be a key factor for the long-term preservation and growth of the company. Despite the successful implementation of innovations, only a few companies understand what is necessary for successful innovation.

(Lam, 2005) also suggests that organizational innovation is a requirement for technological innovation. (Ganter et al., 2013) enhance those organizational innovations that seem to increase the company's ability to adapt flexibly to energetic market environments and/or change leadership by enhancing its capacity for technological innovation.

Organizational innovation is necessary to remain a competitive advantage in any organization if organizations want to progress and improve in any sector of course they want to renew with innovation and change their business in the best way. Recently innovation and change are the main reasons to continuously progress and improve performance in organizations in a different area. Organizational innovation is important to increase ability and to dominate domestic and international business.

### 2.3 Organizational performance:

The concept of representation has gained increasing interest in recent decades, as it has been omnipresent in nearly every field of human endeavor. Performance is a particular observation of reality, which explains many serious ideas about a concept and its measurement tools.

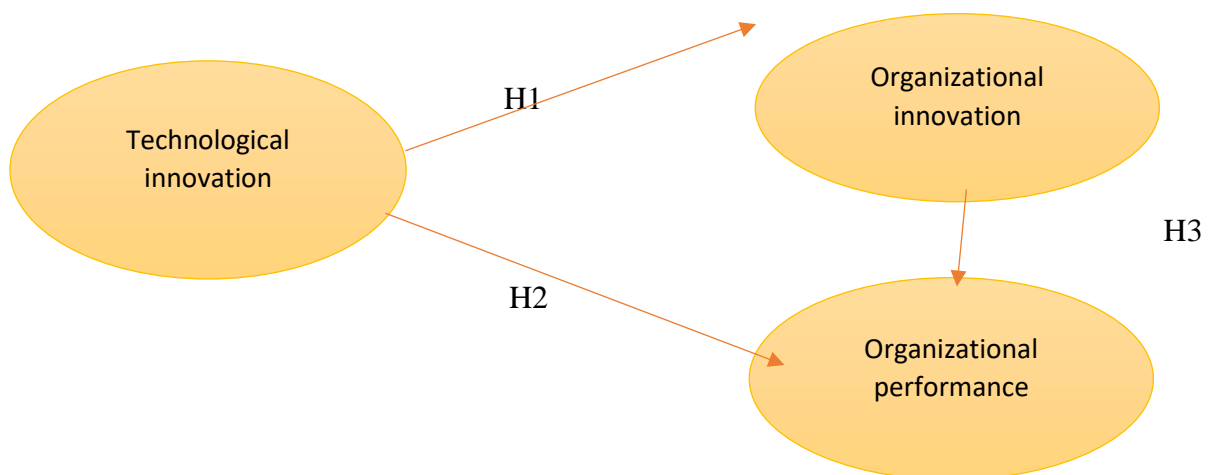
The notion of performance, as it seems to be defined in the French, English, and Romanian dictionaries further define the idea of the result, the goal achieved, quality, and the less economic aspects of efficiency and effectiveness. Dictionary illustration Romanian performance language is defined as "the (particularly good) result obtained by someone in a sports competition; a special achievement in the field of activity; the best result obtained by the technical system, machine, device, etc. (Ion Elena-Iuliana, et al., 2016)

Organizational performance consists of clear behaviors performed by people in their jobs that are related to the goals of their organization (Campbell et al., 1990). It enjoys organizational performance attention organizations due to the high productivity of the importance of the organizations (Hunter et al., 1980). The performance involves behaviors that employees engage in and that can be observed. Despite the strict behavioral definitions of organizational performance, said (Motowidlo et al., 1997) that, rather than the behaviors themselves only, performance is behavior-sided evaluation.

The organizational performance turns to how his organization's discipline change with innovation and how it adapts to change with the technology. The impact of technology increases performance in the organization overall, also every innovation in technology impacts organizational performance. Which is to improve organizational performance is necessary to acquire the technology resource with innovation. Organizational performance can increase through improving organizational change and innovation. To achieve organizational performance with a high degree is necessary to technological innovation and organizational innovation because of the only way to a make difference with your competitor in a business.

## 3. Research Model, Hypotheses, and Methodology

### 3.1 Research model



statistical analysis to evaluate the impact of technological innovation on organizational innovation and organizational performance

### 3.2 Hypotheses:

H1: technological innovation has a significant positive influence on organizational innovation.

H2: technological innovation has a significant positive influence on organizational performance.

H3: organizational innovation has a significant positive influence on organizational performance.

### 3.3 Research methodology:

The study adopted a survey research design that measured two variables, dependent and independent variables. The independent variable is (technological innovation) and the dependent variables are (organizational innovation and organizational performance).

### 4. Statistical Population

The statistical population in this research includes 70 participants in different levels of the profession in Kurdistan. PhDs, masters, bachelors, and diplomas were considered as appropriate respondents for this study. After the distribution of questionnaires in different scientific sites among the respondents, 70 usable questionnaires were gathered.

**Table (1) Descriptive Statistics for Demographic Questionnaire**

Demographic question		Frequency	Percent %
Gender	male	49	70.0%
	female	21	30.0%
Educational level	PhD	18	25.7%
	master	28	40.0%
	bachelor	20	28.6%
	diploma	4	5.7%
Age	below 25	5	7.1%
	25-35	33	47.1%
	36-45	22	31.4%
	above 45	10	14.3%

Table (1) illustrates descriptive statistics of the respondents in this study which categories into different levels for each level of demographic questions Gender, Educational level, and Age of the contributors in terms of frequencies and proportions are presented.

According to the Gender, this table shows that most of the participants their Genders are male which are (70%) percent while (30.0%) percent are female. It is also, clear that (25.7%) percent of the participants their certifications are Ph.D. there is a considerable amount of participants have Master degrees which are (40%) percent, (28.6%) of them have bachelor degrees, only (4%) percent have a diploma. As well according to the results

in the above table (47.1 %), (31.4 %) percent of the participants their ages between (25-35) (36-45) years respectively, for participants who age above 45 years old consists (14.3%) percent of the total, only (7.1%) of participants their ages below 25 years old.

## 5. Results

This study tends to investigate the relationships among technology innovation, organizational innovation, and organizational performance in Kurdistan. The relationships among research variables were tested using the correlation technique that is explained below. For testing our hypotheses, we performed a simple linear regression model applying 5 questions of technology innovation, 5 questions of organizational innovation, and 5 questions of organizational performance. Table 2 shows the questions of research variables. Further, it shows the status of the respondents' answers to each question in the shape of frequency and percentages in a Likert scale table.

**Table (2) Descriptive Statistics for Technological Innovation, Organizational Innovation, and Organizational Performance**

	Strongly disagree		Disagree		Neutral		Agree		Strongly agree		Mean	Standard Deviation
	F	%	F	%	F	%	F	%	F	%		
TI1	0	0.0%	1	1.4%	5	7.1%	28	40.0%	36	51.4%	4.41	0.69
TI2	0	0.0%	1	1.4%	6	8.6%	38	54.3%	25	35.7%	4.24	0.67
TI3	3	4.3%	9	12.9%	23	32.9%	26	37.1%	9	12.9%	3.41	1.01
TI4	0	0.0%	1	1.4%	8	11.4%	33	47.1%	28	40.0%	4.26	0.72
TI5	0	0.0%	1	1.4%	14	20.0%	40	57.1%	15	21.4%	3.99	0.69
TI											4.06	0.40
OI1	0	0.0%	2	2.9%	9	12.9%	34	48.6%	25	35.7%	4.17	0.76
OI2	1	1.4%	10	14.3%	12	17.1%	32	45.7%	15	21.4%	3.71	1.01
OI3	1	1.4%	14	20.0%	18	25.7%	28	40.0%	9	12.9%	3.43	1.00
OI4	1	1.4%	4	5.7%	11	15.7%	30	42.9%	24	34.3%	4.03	0.93
OI5	2	2.9%	9	12.9%	15	21.4%	35	50.0%	9	12.9%	3.57	0.97
OI											3.78	0.53
OP1	1	1.4%	1	1.4%	10	14.3%	25	35.7%	33	47.1%	4.26	0.86
OP2	5	7.1%	6	8.6%	20	28.6%	31	44.3%	8	11.4%	3.44	1.04
OP3	0	0.0%	9	12.9%	16	22.9%	27	38.6%	18	25.7%	3.77	0.98
OP4	0	0.0%	0	0.0%	12	17.1%	32	45.7%	26	37.1%	4.20	0.71
OP5	0	0.0%	0	0.0%	6	8.6%	32	45.7%	32	45.7%	4.37	0.64
OP											4.01	0.45

### Instrument of Reliability Test

The research tool was tested for reliability and foundational validity before the results are presented. A reliability test was carried out using Cronbach's alpha, which measures the internal consistency of a construct. The recommended minimum acceptable limit of

statistical analysis to evaluate the impact of technological innovation on organizational innovation and organizational performance

reliability “alpha” for this measure is 0.60 (Hair et al., 2003 and Blbas, 2019). Cronbach's alpha values were estimated to check the internal consistency of the data after data collection, and Cronbach’s alpha is a scale tool of reliability (Zhong et al., 2017; Vaske et al., 2017; Taber, 2018). More specifically, alpha is a lower bound for true scan reliability. The Cronbach’s alpha reliability of Technological Innovation, Organizational Innovation, and Organizational Performance is more than 0.6 ( $\alpha > 0.6$ ), which indicates the scales demonstrate acceptable reliability.

### Correlation and Regression

Correlation analysis was used to know the relationship between independent variables and dependent variables. Regression analysis is a statistical method that refers to assessing the relationship between the dependent variable and one or more independent variables (Admin, 2021).

**Table (3) Correlation matrix between the independent variable and dependent variables**

	<b>Organizational Innovation</b>	<b>Organizational Performance</b>
<b>Technological Innovation</b>	0.410**	0.295*
<b>Organizational Innovation</b>		0.438**
**. Correlation is significant at the 0.01 level (2-tailed).		
*. Correlation is significant at the 0.05 level (2-tailed).		

Table 3 showed there was a weak significant positive relationship between the independent variable (Technological Innovation) and dependent variable (Organizational Innovation) (0.410) as well as a weak significant positive relationship between the independent variable (Technological Innovation) and dependent variable (Organizational Performance) (0.295). On the other hand, there was a weak significant positive relationship between the independent variable (Organizational Innovation) and the dependent variable (Organizational Performance) (0.438).

**Table (4) Simple Regression Analysis between the independent variable (Technological Innovation) and dependent variable (Organizational Innovation)**

	Coefficients			Model Summary		ANOVA	
	B	t	P-Value	Correlation	R Square	F	P-Value
(Constant)	1.602	2.711	0.008	0.410	0.170	13.750	0.001
Technological Innovation	0.537	3.708	0.001				

Table (4) showed the weak positive correlation between the independent variable (Technological Innovation) and the dependent variable (Organizational Innovation). After finding a weak positive relationship between Technological Innovation and Organizational Innovation (0.41) from Pearson's correlation analysis, it is important to know the prediction and influence rate of Technological Innovation on Organizational Innovation in this study. Also, the same table shows the ANOVA table for checking the goodness of fit for the explanatory variable (Technological Innovation) on the response variable (Organizational Innovation), so the model is appropriate based on ( $F=13.75$  and  $P\text{-Value}=0.001$ ).

The table above contains the result of constant, Slope, t-value, and coefficient of determination (R Square). Regression Coefficient (B) for Technological Innovation is 0.537, which means, increasing one unit for Technological Innovation will increase Organizational Innovation by 0.537. The coefficient of determination (R Square) explains how much variation in the dependent variable is explained by the independent variable. Determination of Coefficient ( $R^2$ ) reflects that 17% of the variation of Organizational Innovation is determined by Technological Innovation and the remaining variation is turning to other factors that affect Organizational Innovation.

**Table (5) Simple Regression Analysis between the independent variable (Technological Innovation) and dependent variable (Organizational Performance)**

	Coefficients			Model Summary		ANOVA	
	B	t	P-Value	Correlation	R Square	F	P-Value
(Constant)	2.664	5.010	0.000	0.295	0.120	6.465	0.013
Technological Innovation	0.331	2.543	0.013				

Table (5) showed the weak positive correlation between the independent variable (Technological Innovation) and the dependent variable (Organizational performance). Following the discovery of a modest positive association between Technological Innovation and Organizational Performance (0.295) by Pearson's correlation analysis, it's crucial to understand the prediction and influence rate of Technological Innovation on Organizational Performance in this study. The ANOVA table for assessing the goodness of fit for the explanatory variable (Technological Innovation) on the response variable (Organizational performance) is also shown in the same table, indicating that the model is appropriate ( $F=6.465$  and  $P\text{-Value}=0.013$ ).

The results of the constant, slope, t-value, and coefficient of determination (R Square) are listed in the table above. The Regression Coefficient (B) for Technological Innovation is 2.664, which suggests that increasing one unit for Technological Innovation will result in a 2.664 rise in Organizational performance. The coefficient of determination (R Square) measures how much variation in the dependent variable can be explained by the independent variable. According to the Determination of Coefficient ( $R^2$ ), Technological



statistical analysis to evaluate the impact of technological innovation on organizational innovation and organizational performance

Innovation accounts for 12% of the variation in organizational performance, with the rest variation attributed to other factors that influence organizational performance.

**Table (6) Simple Regression Analysis between the independent variable (Organizational Innovation) and dependent variable (Organizational Performance)**

	Coefficients			Model Summary		ANOVA	
	B	t	P-Value	Correlation	R Square	F	P-Value
(Constant)	2.585	7.233	0.001	0.438	0.193	16.188	0.001
Organizational Innovation	0.376	4.023	0.001				

Table (6) showed the weak positive correlation between the independent variable (Organizational innovation) and dependent variable (Organizational performance). Following the discovery of a weak significant positive relationship between Organizational innovation and Organizational performance (0.41) via Pearson's correlation analysis, it's crucial to understand the prediction and influence rate of Organizational Innovation on Organizational performance in this study. The ANOVA table for the explanatory variable (Organizational Innovation) on the response variable (Organizational Performance) is also included in the same table, indicating that the model is appropriate (F=16.188 and P-Value =0.001).

The results of the constant, slope, t-value, and coefficient of determination (R Square) are listed in the table above. Organizational Innovation has a Regression Coefficient (B) of 2.585, which suggests that raising one unit for Organizational Innovation will boost Organizational performance by 2.585. The coefficient of determination (R Square) measures how much variation in the dependent variable can be explained by the independent variable. The Determination of Coefficient (R<sup>2</sup>) shows that Organizational Innovation accounts for 19% of the variation in organizational performance, with the rest variation attributed to other factors that influence organizational performance.

**Table (7) the result of the hypothesis test**

No	Hypotheses	Beta coefficient	t-value	Results
H1	Technological Innovation on Organizational Innovation	0.537	3.708	Accept
H2	Technological Innovation on Organizational Performance	0.331	2.543	Accept
H3	Organizational Innovation on Organizational Performance	0.376	4.023	Accept

Table 7 summarizes the hypotheses test result in terms of beta coefficient (standardized) and t-value in significance levels of 0.05.

## 6. Conclusion:

There is no doubt that innovation has had a significant impact on organizations in general. The objective of the use of technology was to improve organizational performance, as well as to use technological innovation to achieve organizational objectives in the best way. The result of this study clearly showed that to improve organizational innovation and organizational performance, organizations can focus on technological innovation. Due to the technological innovation is increase the organizational innovation and organizational performance is the best manner in the organization overall. Furthermore, organizations can also improve organizational performance by improving the level of organizational innovation. Thus, organizations can improve overall performance by embracing innovation.

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statistical analysis to evaluate the impact of technological innovation on organizational innovation  
and organizational performance

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