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Evaluation of computer networks with administrative structure at Islamic Azad University

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Abstract

The purpose of this study is to evaluate and compare the dependency between administrative structure and design and implementation of computer networks in Islamic Azad University. So, a collection of data shows the administrative structure and network administration is needed. The major of the proposed hypotheses is that there is a significant relationship between administrative structure variables, computer network administration and distributing variables. In this study, more than 150 questionnaires have been distributed among the participants. 100 questionnaires were answered, and then the required information test hypotheses were extracted. For testing the research hypotheses, chi-square test displayed the relationship between variables. Correlation coefficients were positive and inorder to evaluate the reliability of questionnaire, Cronbach's alpha test was used. The results of examination of the relationship between variables showed that there is a meaningful relationship among all variables. Thus, all the proposed hypotheses were proved.

Keywords: Administrative structure, Computer network administration

Introduction

With regard to the daily growth and development of technology, the necessity of evolution in traditional and static structures is quite evident. Being in such a changing and dynamic environment has led managers to make use of the latest technology in order to increase the efficiency ratio and productivity of organizations. The emergence of a new branch of science called the information and Telecommunication technology and its management can be a proof for this claim. Transition from the traditional structure to a dynamic and evolved structure requires infrastructures that ignoring them makes this transition costly and problematic for organizations. Therefore, the management of organizational evolution might be the most important management of the present time. Because the management's planning and guiding a variant and dynamic combination is a very technical and complicated task. With this trend the more structural is the planning and organizing of an organization the brighter future it will face.

Universities as centers of training the latest sciences and nurturing the country's prodigies cannot be excluded from this rule therefore utilizing and developing the information and telecommunication technology in order to move toward a bright future along with values and the main goals of educational and university systems is vital.

The infrastructure of information and telecommunication technology is computer networks, advanced computer utilities and they require structural, standard design and proper administration.

Establishing an integrated computer network at university based on the latest engineering principals prepares an infrastructure in which managers can plan the universities for moving toward a dynamic and virtual structure by utilizing the modern technologies and long-term strategies.

Computer networks are also of great significance in transaction of data among clients (students, tutors, employees, etc) and their access to databases is essential and should not be ignored. Most of the problems with current networks concern with their designing factors. Designing is the most important aspect of establishing a network to meet its desired objectives which must be designed with great accuracy.

The content of this article deals with assessing the design and administration of the computer network at universities environment and colleges. According to the definition given by CISCO Company, cam-

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pus network is referred to an organization's internal networks of distributed buildings which are under the possession and control of an office or a group of people (Sprent and Smeeton, 2001). With the growth and expansion of computer use in industry and offices and growing demands of an organization's sectors for various computer services and a need for sharing hardware and software resources in order to have a shared access in an organization, computer networks with appropriate and powerful platform are needed.

Computer network that satisfy the present demands is extensible in case of the future growth and development of an organization. With regard to above statements we decided to assess the influence of organizational structure's variables on design and administration of integrated computer networks by surveying the universities and colleges.

The rest of this paper IS organized as follows. Section 2 introduces related work in the field of organizational structure. The main objective of this research and the definitions of variables and hypotheses are situated in part 3 and 4 respectively. In section 5 the research methodology will be discussed. The data collection, data analyzing and the conclusions are given in section 6, 7, and 8 respectively.

Literature review

Different studies have been done in IT and organizational structures. Although a comprehensive relationship between organizational structure and computer network administration is not achieved, they have covered some of the related issues. Fredric 10 stated the information and communication technology development regarding the possibility of improved flexibility and accuracy of programs created and there are many hypotheses in terms of information technology. In this research it is also assessed that there is a meaningful relationship between the organization and flexibility. David, *et al.* (Frederick, 1999)expressed that developments in information technology has been complementary organizational changes to improve service quality. According to their research, it can be seen that there is a meaningful relationship between the size of organization and organizational structure. Their research also shows that human resource management based on the information technology ideas the required skills of managers in terms of managing the most organizations increase. Therefore according to these studies it can be seen that a comprehensive relation regarding the organizational structure and administration of campus networks has not been attained.

Several studies in the field of information technology and organizational structure have been done. Although the comprehensive relationship between organizational structure and computer networks management has not been achieved some of the relevant issues are covered (Meeker *et al.*, 1998). Thomas (Valentine *et al*, 2002) has discussed the relationship between organizational structure and computer networks flexibility. He claimed that the production hierarchy in the rapidly changing environments has greater flexibility to hierarchical organizations. In this paper, the study in terms of the meaningful relationship between the size and flexibility of organization has been done. Also, according to the results of this study, a significant relationship between organization size and organizational structure are observed. Generally speaking, according to such studies, it can be viewed that there has not been achieved a comprehensive relationship between campus network management and organizational structure.

Main Objectives of the study

• Designing a unified computer network for a university with Fiber Optic infrastructure and structural cabling appropriate with organizational structure

• Assessing the relationship between organizational variables with computer networks features.

Research hypotheses

The chief question is that whether there is a relationship between organizational structure, administration and campus network designing in universities? And if there is a re1tinnchin in Huh case this relation is meaningful and significant? Therefore the research hypotheses are described as follows:

First hypothesis: There is a meaningful relationship between procurement the required human resources and computer network administration.

Second hypothesis: There is a meaningful relationship between computer network functionality and documentation of job procedure.

Third hypothesis: There is a meaningful relationship between computer network standardization and organizational levels.

Forth hypothesis: There is a meaningful relationship between the scale of utilizing new technologies and variability of geographical environment.

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Fifth hypothesis: There is a meaningful relationship between human resource distribution and computer network administration.

Sixth hypothesis: There is ~ meaningful relationship between the scale of staff training and organizational concentration.

Defining Research ariables

Network Management: The concept of different tools to manage the networks and systems

Organizational Level: It concerns with the organizational chart height.

Organizational Concentration: It deals with the decision making level in the organization.

Network Standard: Standardization on the exchanging information among hardware and software systems which is based on computer network

Variety of computer network: It concerns with the distribution of university branches in different environments.

Materials and Methods

Statistical Test for Proving Results

In this research we try to assess the relationship among management variables and computer network designing and organizational structure variables. On the other hand in using the statistical technique there is always the issue that which statistical methods should be used regarding the type of data distribution (Newson, 2009). In this research according to the type of data collection via questionnaire and using "Likert" (Valentine *et al.*, 2002; Zinbarg *et al.*, 2005).Scale in designing the questionnaire, non-parametric statistic is used. Necessary statistical tests and the type of circumstantial evidence being used for analyzing the results in reliability level of 98% are given in table 1.

Table 1. Statistical tests for multivariate regression

Hypothesis	Type of Lest used	Type of statistic users
All	Variables Relationship	Chi-square
	Intensity and correlation Type	Somer's-d, Kendall's Tau-b, c, Ciamma
	Reliability Test	Cronbach's Alpha

Data Collection Procedure

Questionnaire

Data collection in this research is done through questionnaire distribution with 50 questions. ~ is designed according to Likert scale.

Dependability of Measurement Tools

Dependability is one of the technical characteristics of a measurement tool. The mentioned concept deals with this issue that to what extent a measurement tool yields the same results in the same conditions. Regarding this issue the range of dependability coefficient is often from Zero (non-related) to +] (full related). The dependability coefficient indicates to what extent a measurement tool measures the features with test stability or variable and temporary features. It is worth knowing that the dependability in a test can be different from one situation to another or from one group to another. Various methods have been used to calculate the reliability coefficient of measurement tools, such as: Test-Retest method (Von Eye, 2005).equivalent method, Split-half (2006). andKuder- Richardson(Cronbach, 1951). Cronbach's Alpha method (Alper, 1985; Christensen, 2005; Roger Newson, 2002; Zinbarg *et al.*, 2006). In this research Cronbach's Alpha has been used for identifying the dependability of questionnaire.

Cronbach's Alpha Method

One of the calculation methods of dependability is using Cronbach's Alpha method. This method IS use for calculating the internal coordination of measurement tool which is used for measuring various features such as questionnaires tests. Cronbach's Alpha coefficient is given by the following relation (Christmannand Aelst, 2002).

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum S_i^2}{S_T^2}\right)$$

Meanwhile, J is the number of questionnaire or test questions. 5,2 is the Variance of We ilk subtest and is the variance of the whole test.

Validity of Questionnaire

The concept of validity answer in this question that to what extend the measurement tools measures the desired feature. With having no knowledge of the mea-

surement tool validity the resulted data are not reliable. The measurement tool might be valid for measuring a specific feature, while it will not be valid for measuring the same feature on another community.

Statistical population and sample

All the required information of this research has been collected through distributing 150 questionnaires among universities and colleges. It is worth saying that from 150 questionnaires, 92 questionnaires were answered.

Table 2: Summary statistics based on the degree of responders

Academic Level	%
Technician	10
Bachelor	80
Master	10

Table 3: Summary statistical information in response to gender

Sex	%
Man	70
Woman	30

Table 4: Summary statistics based on the age of responders

Age	%
20-25	5
25-30	30
30-35	45
Over 35	39

Table 5: Summary statistics based on the work experience of responders

Test	%
Less than 3 years	10
3 to 6 years	42
6 to 9 years	40
Over 9 years	12

Research Variables

The research variables used in this research are human resource procurement and administering computer networks which refer to the linking hardware set and user interface software which are used for controlling the computer network tools and equipment and supervising their functionality as a unified system. Other variables of this research are also computer network functionally, office bureaucracy, utilizing new technologies, variability of geographical environment, the human resource distribution pattern, organizational decision making and staff training.

Non-Parametric Statistic and Parametric Statistic

One of the statistical classifications is classifying into parametric statistic and non-parametric statistic. For quantitative parts, parametric statistic is used. For using parametric statistic, some prototypes are necessary such as normalization of population distribution. Non-parametric statistic is used for hypotheses part with quantitative variables. These tests which are called tests with no prototype have no special prototype. With regard to the mentioned. Statements and gathered information in this research non- parametric statistic must be used.

Measurement Scales

One of the most fundamental and major issues proposed in the research method is understanding this issue in the most general case, variables measurement scale is divided into four categories which are, nominal scale [31, ordinal scale (BurnsAlvin and Ronald, 2008). Wuensch (2009) interval and ratio scale (Thomas and Malone, 1985). According to the type of defined valuables in this research and the type of their questions via questionnaire and Bikers scale. All the variables have graded scale.

Hypothesis Testing Statistical Method

According to proposed arguments in this research x^2 test which is a non-parametric test is used. For computing the test statistic the following expression is used FIG.

$$x^2 = \sum_{i=1} \sum_{j=1} \frac{\left(O_{ij} - E_{ij}\right)^2}{E_{ij}}$$

In this formula O_{ij} is the number of observed abundance in each of the table's cells and E_{ij} our desired abundance. For doing the test the following hypotheses are available.

H0: There is not a meaningful relation among variables.

H1: There is a meaningful relation among variables.

Correlation Coefficient

Correlation and Casualty The dependency intensity of two variables to each other is called correlation. The more dependent are two variables to each other the more their correction scale is. Maybe for decision makers the direction of correlation might be as important as the dependency of two variables. In other words a manager is not just interested to know that there is a relationship between the computer network standardization scale and the number of staff's organizational levels. Moreover he/she is interested in the condition and direction of the relation of these two variables and want to know by increasing a variable the other variable will increase or not.

Correlation Coefficient and Measurement Scal

Computing the correlation coefficient is much influenced by variables measurement scale. Correlation coefficient for each of the above cases is different based their nature since the variables

Studies are graded therefore in the following section we deal with assessing the coefficient that measures the correlation among graded variables.

Correlation Coefficient when two variables have graded scale

The following correlation coefficient is used for evaluating the relationship among the variable: Correlation (Goodman *et al.*, 1972; Joreskog and GPsychometrik, 1994). Kendall's Tau-b Coefficient (David, 1998). Kendall's Tau-c coefficient 8], and, Somer's-d (Malone, l987).

Somer's-d Correlation Coefficien

Somer's d coefficient is so close to Gamma Correlation coefficient. Gamma, Kendall's Tau-d and Kendall's Tau-C correlation coefficients are all symmetry. This means that, in computing them, assuming that dependent and independent variables are specified no change will happen and in both cases the value of correlation coefficient is constant.

The interesting point is that d coefficient is a form of Gamma indicator that one of the variables is dependent and the only different with Gamma is that it has twisted pairs independent variable in its denominator in addition to coordinated and reverse Air. For computing the correlation the following equation is used (Stevens, 2001; Revelle and Zinbarg , 2009).

$$d = \frac{N_s - N_d}{N_s + N_d + T_y}$$

Gamma Correlation Coefficient This coefficie

This resulted from interaction of coordinated pairs and reverse pairs. If the number of coordinated pair are more than reverse pairs the relationship of two variables are positive and if the number of reverse variable are more than coordinated variable the relation of two variables is reverse.

If the number of reverse variables and coordinated variable are equal, there is no relationship between them. The Gamma Correlation coefficient is given by the following equation.

$$\gamma = \frac{n_s - n_d}{n_s + n_d}$$

Where, ns are the number of coordinated pairs, n_d is the number of reverse pairs and γ is the correlation coefficient.

Kendall's Tau - b Correlation Coefficient

Kendall's tau-b correlation coefficient is given by the following equation (Seungnam Kang, 2002).

$$T_b = \frac{N_s - N_d}{\sqrt{\left(N_s + N_d + T_y\right) * \left(N_d + T_x\right)}}$$

Where N_s the number of coordinated pairs is, T_y is the number of pair thathas been twisted in y variable, T_x is the number of pair that has been twisted In x variable and N_d: The number of reversed pairs.

Kendall's Tau-c

In the above equation m shows the number of smallest row or column and n is the number of

$$T_c = \frac{2m\left(N_s - N_d\right)}{n^2\left(m-1\right)}$$

In the above equation m shows the number of smallest row or column and n is the number of sample.

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Results

Table 6: Summary of the statistical information

	N	%
Valid	53	67.1
Invalid	26	32.9
Sum	79	100

Results of the Kronbach-Alpha test

As it can be seen the computed Kronbach-Apha is 83% which is bigger than the specified standard (70%) that is an indication of the reliability of questionnaire.

The conclusions of this study are reported here with regard to the hypotheses

The First Hypothesis: There is a meaningful relation between human resource procurement and computer network administration.

Table 7: Computations of Kronbach-Alpha

Kronbach-Alpha	Balanced Kronbach-Alpha Based on standardized Items	N of items
0.828%	0.832%	53

Table 8: Statistical information of the First Hypothesis

Cases					
Valid information		Incomplete information		Total	
N	Percent	N	Percent	N	Percent
88	97.5%	4	4.3%	92	100%

1. By comparing the resulted X^2 value of (26.42) with its critical value in the error level of 5%, the meaningfulness of the relationship between two variables is accepted. In other words HI is accepted. Since Asymp. sig is smaller than 5% confirms the acceptance of Hl hypothesis relation between two variables

2. The computed value of correlation coefficient which is 57.4% shows that roughly 57.4% of variations of computer network administration are explained by human resource procurement variable.

3. The obtained correlation coefficient shows a positive correlation between two variables.

The second hypothesis: There is a meaningful relationship between computer network functionality and documentation.

Table 9: Chi-Square Test of the First Hypothesis

	Value	df	Asymp.sig.(2-sided)
Pearson Chi-Square	26.422	10	.003
Likelihood Ratio	27.016	10	.003
Linear-by-Linear Association	9149	1	.002

Table 10: Correlation Coefficient of the First Hypothesis

Correlation Coefficient		value	Asymp. Std. Error	Approx. T	Approx. Sig
Ordinal by ordinal	Kendall,s tau-b	.439	.136	3.141	.002
	Kendall,s tau-c	.470	.149	3.141	.002
	gamma	.574	.167	3.141	.002

Table 11: Statistical information of the second hypothesis

Cases					
Valid information		Incomplete information		Total	
N	Percent	N	Percent	N	Percent
88	100%	0	0%	88	100%

Table 12: Chi-square test of the second hypothesis

	value	DF	Asymp.sig.(2-sided)
Pearson Chi-Square	99.642	32	.000
Likelihood Ratio	108.793	32	.000
Linear-by-Linear Association	1.502	1	.220
	88		

Table 13: The correlation coefficient of the second hypothesis

		value	Approx.sig
Ordinal by ordinal	Phi	1.064	.000
	Somers'd	0.532	.000

1. By comparing the resulted value of X2 (99.64) with its critical value in the error level of 5%, the meaningfulness of the relation between two variables is accepted. In other words H, is accepted. Since Asym.sig is smaller than 5% it confirms the acceptance of hypothesis relation between two variables.

2. The computed value of correlation coefficient which is 0.532 shows that roughly 53.2% of variations of computer network administration is explained by human resource procurement variable.

3. The obtained correlation coefficient shows a positive correlation between two variables

The third hypothesis: There is a meaningful relationship between computer network demonstration and organizational levels.

Table 14: Statistical information of the third hypothesis

Cases					
Valid information		missing		Total	
N	Percent	N	Percent	N	Percent
88	100.0%	0	0%	88	100.0%

Table 15: Chi-square test of the second hypothesis

	value	DF	Asymp.sig.(2-sided)
Pearson Chi-Square	99.642	32	.000
Likelihood Ratio	108.793	32	.000
Linear-by-Linear	1.502	1	.020

Table 16: The correlation coefficient of the second hypothesis

		value	Approx..sig
Ordinal by ordinal	Phi	1.064	.000
	Somers'd	0.532	.000

The results show that

1. By comparing the resulted value of X^2 (99.64) with its critical value in the error level of 5%, the meaningfulness of the relation between two variables is accepted. In other words H_1 is accepted. Since Asym.sig is smaller than 5% it confirms the acceptance of H_1hypothesis relation between two variables.

2. The computed value of correlation coefficient which is 0.532 shows that roughly 53.2% of variations of computer network administration is explained by human resource procurement variable.

3. The obtained correlation coefficient shows a positive correlation between two variables.

The forth hypothesis: there is a meaningful relation between the scale of using new technologies and variability of geographical environment.

Table 17: Statistical information of the forth hypothesis

Cases					
Valid information		missing		Total	
N	Percent	N	Percent	N	Percent
85	94.4%	7	7.6%	92	100.0%

Table 18: Chi-Square test of the forth hypothesis

	value	Df	Asymp.sig.(2-sided)
Pearson Chi-Square	41.957	18	.001
Likelihood Ratio	52.539	18	.000
Linear-by-Linear association	.694	1	.005

Table 19: The correlation coefficient of the forth hypothesis

		Value	Approx..sig
Ordinal by ordinal	Phi	.703	.001
	Somer,d	.406	.001

The resulted information shows that,

1. By comparing the resulted value of X2 (41.95) with its critical value in the error level of 5%7 the meaningfulness of the relation between two variables is accepted. Ill other word is accepted. Since Asym. sig is smaller than 5% confirms the acceptance of H. hypothesis relation between two variables.

2. The computed value of correlation coefficient which is 0.406 shows that roughly 40.6% of variations of computer network administration is explained by human resource procurement variable.

3. The obtained correlation coefficient shows ~ positive correlation between two variables.

The fifth hypothesis: there is a meaningful relation between human resource distribution and computer network administration.

Table 20: Statistical information of the fifth hypothesis

Cases					
Valid information		Missing		Total	
N	Percent	N	Percent	N	Percent
82	89.1%	10	10.9%	92	100.0%

Table 21: Chi-square test of the

	Value	Df	Asymp.sig.(2-sided)
Pearson Chi-Square	66.258	15	.000
Likelihood Ratio	65.558	15	.000
Linear-by-Linear association	18.027	1	.000

Table 22: The correlation coefficient of the sixth hypothesis

			value	Asymp-std.error	Approx..t	Approx..sig
Ordinal	Somers,d	symmetric	0.443	0.069	6.210	.000

The resulted information shows that,

1. By comparing the resulted value of x2 (66.25) with its critical value in the error level of 5%, the meaningfulness of the relation between two variables is accepted. In other words H, is accepted. Since Asym.sig is smaller than 5% it confirms the acceptance of H, hypothesis relation between two variables.

2. The computed value of correlation coefficient which is 0.443 shows that roughly 44.3% of variations of computer network administration is explained by human resource procurement variable.

3. The obtained correlation coefficient shows a positive correlation between two variables. 7.7. Sixth hypothesis: there is a meaningful relation between the scale of staff training and organizational concentration.

Table 23: Statistical information of the sixth hypothesis

Valid information		Cases missing		Total	
N	Percent	N	Percent	N	Percent
88	95.7%	4	4.3%	92	100.0%

Table 24: Chi-square test of the sixth hypothesis

	value	Df	Asymp.sig.(2-sided)
Pearson Chi-Square	438.025	143	.000
Likelihood Ratio	284.330	143	.000
Linear-by-Linear association	32.817	1	.000

Table 25: The correlation coefficient of the sixth hypothesis

		value	Asymp-std.error	Approx..t	Approx..sig
Ordinal y ordinal	Kendall,s tau-b	.540	.077	6.889	.000
	Kendall,s tau-c	.535	.078	6.889	.000
N of valid cases		88			

The resulted information shows that,

1. By comparing the resulted value of X. (438.02) with its critical value in the error level of 5%, the meaningfulness of the relation between two variables is accepted. In other words Hl is accepted. Since Asym.sig is smaller than 5% it con-

firms the acceptance of HI hypothesis relation between two variables.

2. The computed value of correlation coefficient which is 0.54 shows that roughly 54% of variations of computer network administration is explained by human resource procurement variable.

3. The obtained correlation coefficient shows a positive correlation between two variables.

Conclusion

The infrastructure of information technology and telecommunication are computer networks and advanced computerized tools. This research deals with assessing and analyzing the relationship between organizational structure and administration of computer networks in universities and colleges. Establishing an integrated computer network in university based on the newest engineering principals is a basic issue in developing information technology. Results and analysis results from research hypothesis test whose results are given briefly in table 7 to 25 indicate a meaningful relationship between organizational structure variables and administering computer networks in all hypotheses. This issue means that using the assessed structural variables for establishing computer networks is useful. According to the results obtained from hypotheses test it became clear that the relationship among organizational variables and computer network management variables has high correlation coefficient intensity. It can be concluded considering the mentioned organizational structure variables can have a significant effect on the success of computer network implementation and installation .For more study in this field, it is suggested to study the relationship between computer network security and organizational structure in universities and colleges according to importance of available information in campus network.

Therefore, applying the results will cause powerful infrastructure in a way that the managers will be able to make the universities close to the dynamic and virtual structure.

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