INFORMATION MANAGEMENT QUANTITATIVE ANALYSIS BASED ON THE ACTOR NETWORK THEORY

KVANTITATIVNA ANALIZA UPRAVLJANJA INFORMACIJAMA ZASNOVANA NA TEORIJI MREŽE AKTERA

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ABSTRACT

We formulated a modern understanding of the information management based on the sense of the Actor Network Theory (ANT). ANT provides an analytical framework, drawing from Science and Technology to study the roles played by humans and non-humans factors in the structuring performance of the the Libyan Libyan academy of the graduate studies. The research is done through a field study that shows and proved our assumptions.

SAŽETAK

Formulisali smo moderno razumevanje upravljanja informacijama zasnovano na smislu Teorije mreže aktera (ANT). ANT pruža analitički okvir, oslanjajući se na nauku i tehnologiju za proučavanje uloga koje igraju ljudi i neljudski faktori u strukturiranju performansi libijske libijske akademije diplomskih studija. Istraživanje se provodi kroz terensku studiju koja pokazuje i potvrđuje naše pretpostavke.

INTRODUCTION

In the literature, the institutional information management recognizes management as the systematic activities undertaken by human and nonhuman to ensure the use of institutional resources and employees' behavior according to the main strategies and objectives [1, 2, 3, 4]. Recently, and because of the rapid growing need for the information management system with effective designs and uses, a considerable research has been conducted to discover optimal designs and circumstances in dealing with the academic systems. This include control systems to manage relationships and activities between different units inside the institute as well as the gneneral management system within the institution.

Most of the recent acadmic studies are tending to observe relationships Within inter-institutional performance by using transaction cost economic theory and agency theory. Agency theory typically provides attention to the incentive problem and information asymmetry issue occurring in an inter-institutional organization. Transaction cost economic theory keeps that three discrete structural mechanisms (market, hierarchy, and clan) govern a transaction. Incidentally, Dekker (2004)[5] argued that treating any inter-organizational relationship as 'a generic intermediate mode between market and hierarchy' as ambiguous, considering that it is in facts comprised of heterogeneous phenomena.

In order to have a new intrpretation to the modern institutional management based on the revlution of the information technology, it is mandatory to consider social factors and technological motives built from social theories such as Actor-Network Theory (ANT). ANT is first proposed by Michael Callon, Bruno Latour and John Law to understand how science and technology is created, developed and improved [6, 7, 8, 9, 10, 11]. Its basic assumption is that any unit is

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the result of the assemblies and interactions of heterogeneous actors and their networks. It does not infer any consequence or antecedent; instead claims that actors have their own interests and agendas. ANT's distinctiveness is shaped by the symmetrical attention it gives to human and nonhuman entities, by bringing to the fore the analytical view of intermediary objects and inscriptions [12].

We consider the same definition of Actors in ANT, whereas they consist of humans and non-humans actors; there is no difference between people and objects [13]. The term 'actors' is defined as entities that are able to associate texts, humans, non-humans and money [14]. The theory is best fit with our case of the information management since it emphasizes the notion of symmetry, McLean and Hassard (2004)[15] explained that, in order to understand complex social situations, human, non-human, social and technical elements shall not be separated in analysis. Therefore, the theory's core idea is that human (academic and empolyee) and non-human (computers, educational tools,…) actors in the system (the istitution) are enrolled in a network that aims to achieve the main function through a process of translating various interests [12, 15]. Within this process, the actors, the networks in which they participate and the ideas they advocate are continually translated in order to achieve network stability. When the stability of the network is reached, and when the actors can be represented as a united, single actor, the network is referred to as an actor–network [12, 15] ANT assumes that all phenomena are the effects or products of heterogeneous networks [13]. So, this concept is formulated in our survey questions at the Libyan academy of the graduate studies to investigate how facts or objects are held together by a diverse set of elements. Moreover, the uniqueness of the ANT lies in the assumption that each party or actor—human and non-human has its own interests. The assumption is applied to a number of management change studies where they presume the process and result

of actors' interactions to align different interests would trigger, develop and shape the instution change. This includes studies by Chua (1995)[16], Chua and Mahama (2007)[17], Dambrin and Robson (2011) [18], Miller (1991)[19], Preston, Cooper and Coombs (1992)[20], Robson (1991, 1992) and Skærbæk (2009) [21, 22,23]. Likewise, our paper seeks to explain how the ANT can be used in studying the effects of inter-institional.

As we explained earlier, ANT offers a perspective for understanding how and why information managment is developed and used in the institution network. In answering the research question, researchers must have an in-depth understanding of the issues that require contextual insight into management and institional processes in their standard setting. This is attainable through quantitative research that accentuates interpretations of people's meanings [18, 19, 20]. In establishing that quantitative research is appropriates for this purpose, there is a need to describe how individuals view the system network by identifying the relevant spectrum(s) of the research paradigm that guide the research design and data collection efforts. Quantitative research usualy adopts a holistic view and relies on rich descriptions of reality, where phenomena and situations need to be understood as a whole [18, 21]. A phenomenon is considered a naturally occurring event, program, relationship or interaction that a researcher does not attempt to manipulate as it has a predetermined course [21]. Therefore, our main task in this study is to explain how Actors (people) come to understand, account for, take action and manage their day-to-day situations [19]. Regarding information management approach, Parker (2012) [22] mentioned that the qualitative tradition allows for exploration of the intricacies of the implementation, structures and outcomes of information management together with institutional processes and their interplay with their surroundings. Van der Meer-Kooistra and Vosselman (2006) [23] suggest

that the focus of quantitative studies is on understanding how the structures and practices of information management interact with, reflect, create, and the effects of events and changes within the Libyan academy of the graduate studies. For these reasons, adopting quantitative research enabled us to understand the chemistries and meanings of how information management-based ANT could be better designed and operate within their context and how the relevant phenomenon and context influence one another. To do so, the data is derived from multiple sources in the form of questions obtained from survay, interviews, observation data and documents collected by using a case study approach. In the following sections we will show our results and disscusion.

RESULTS AND DISSCUSION

In the previous sections, the mechanisms of employing information management based on ANT applications in institutions were discussed. In order to develop the performance of the various services and activities offered by the Libyan Academy of Graduate Studies, this section comes to analyze the applied study conducted at the Academy, which is a field projection of what was addressed in previous introducton, to solve the problem of the study and test its hypotheses, In addition to the interpretation of the results reached and provide a set of suggestions. For this reason, this study includes three topics, Methodological framework for field study, Presentation and analysis of the results, and Test the hypotheses of the study and discuss the results. But, we will concentrate in the first topic, which represents the nature of the paper aim.

The first topic: the methodological framework of the field study

This item deals with the scientific methodology adopted in the field study, the research tools used in data collection,

in addition to introducing the society and sample of the study. Examine the validity and reliability of the study tool.

The first requirement: Methodology and tools of study

Each scientific study requires a scientific method and research tools to help achieve the objectives of the research, and this will be clarified through this requirement.

Study Methodology

The curriculum is a set of processes and steps taken in order to achieve the research. A form of description, analysis and scientific interpretation in order to describe the phenomenon quantitatively and qualitatively, through the collection of theoretical information and field data, classification and analysis and subject to study".
The following descriptive analytical methods were used:

– Survey research method: by collecting data from the primary sources represented in the questionnaire as a basic tool for data collection and interview with some members of the study sample.
– Field method: through observation during field study.
– Descriptive method: Using many secondary data sources from references in Arabic and previous studies to gain knowledge of the theoretical side of this study through the desk survey, and browse specialized websites related to the subject of the study in order to extract the required information and statistics.

Second requirment: Study tools

The tools used to collect the data of this study were: interview, scientific observation, questionnaire, and a set of statistical methods were used to analyze this data.
1. Interview: A key tool for data collection is: "A conversation between the interviewer and another person or several people. The

information obtained by the researcher from other sources, in addition to its ability to obtain the types of data and confidential information that the respondent hesitates to answer"

For this study, we have relied on the method of direct interview structured with some deans of faculties and heads of scientific departments and deputy assistants, who were able to meet, the main objective was to obtain the largest volume of information to be used in the analysis of the results of the study.

2. Scientific observation: "It is an important tool in the collection of information, and it depends on the senses of the researcher and his ability to translate what he observed or touched facts and events into phrases with meanings and semantics," where he informed the researcher on the website of the university under study, as well as while touring the In order to distribute questionnaires to individuals, the faculties and departments of this university recorded the most important observations related to their working conditions, with a view to using and employing them during the analysis of the questionnaire.

3. Questionnaire: The questionnaire is one of the most important tools for collecting raw data. It is defined as: "A sample questionnaire that is directed to individuals in order to obtain information about a subject, problem or situation. It was relied upon as the main research tool in this study in order to ascertain the information obtained in the theoretical aspect of access to field information, in addition to other reasons, including:

– An important means of obtaining data from many individuals far beyond the size covered by other data collection tools such as observation;

– The possibility of examining and reviewing the questionnaire, as well as the possibility of field testing;

– Respondents' answers to questionnaire questions may be more accurate and objective because the respondent is unknown Personal.

As for the objectives of the questionnaire and the mechanism through which it was designed, it can be explained as follows:

A. Objectives of the questionnaire: The main objectives of the questions asked in the questionnaire are:

– Identify the trends of the study sample members on the level of adoption of informational management based on ANT applications in the field Administrative activities of the Academy under study;

– Identify the trends of the study sample members on the level of adoption of informational management based on ANT applications in the field Educational activities at the Academy in question;

– Identify the attitudes of the study sample on the level of performance of the Academy under study.

B. Design of the questionnaire: In order to test the hypotheses of the study has been designed in accordance with the plan adopted, where the researcher used the information contained in the theoretical side and formulated in the form of phrases fall within specific questions in addition to benefit from a number of previous studies related to the subject of study the questionnaire covered the following two main themes:

The first axis: relates to the level of adoption of informational management applications in the university under study, this axis has been designed in two dimensions as follows:

– The first dimension: related to the applications of informational management in the field of administrative activities;

– The second dimension concerns the applications of informational management in the field of educational activities;

– The third dimension: related to the applications of informational management in the field of office activities.

The second axis: relates to the level of performance of the university under study.

Table 1: Shows the two main axes of the questionnaire: In addition to the previous two axes, a hub was relied on for the job data associated with individuals

Questionnaire axes	Axis / Dimension Name			Phrase numbers	Number of phrases	percentage %
The first axis	The level of application of information management in the academy under study	The first dimension	Applications of informational management in the field of administrative activities.	1 - 20	20	37,04
		The second dimension	the applications of informational management in the field of educational activities	21-30	10	18,52
		The third dimension	Applications of informational management in the field of office activities.	31-40	10	18,52
The second axis	Performance of the academy under study			41-54	14	25,92
Total				1-45	54	100

Source: Prepared by the researcher based on the questionnaire data.

The study included five elements: work place, job position, years of academic experience, academic qualification, grade 1. The main objective of adopting this axis with its components. The effect of the latter on the answers of the study sample to the various statements in the main questionnaire axes. A five-dimensional Likert scale was also relied upon to test hypotheses, from which to answer a problematic the study, according to the following:

Table 2: Likert scale [24, 25]

Rating	Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
Degree	1	2	3	4	5

The minimum and maximum categories were calculated by calculating the range (5 - 1 = 4), then this value was divided to the lowest value (5/4 = 0.8), then after that added to the lowest value which is (1), up to the highest value (5), Thus, the length of the categories become as follows: [1 – 1.8]: very weak approval; from [1.8 – 2.6]: weak approval; from [2.6 – 3.4]: medium approval; [3.4, 4.2]: high approval; [4.2, 5]: Very high approval.

Second requirement: Statistical tools

In order to achieve the objectives of the study and test its hypotheses, the statistical package for social sciences (SPSS) version (22) is implemented and used (https://www.ibm.com/analytics/spss-statistics-software) [26].

1. Alpha de Cronbach: One of the coefficients of stability measurement is a correlation coefficient between the statements of the scale, which is interpreted according to the following values: (greater than 0.9 excellent, greater than 0.8 good, greater; 0, 7 Acceptable,

greater than 0.6 doubtful, greater than 0.5 weak, less than 0.5 unacceptable).

2. Factor validity coefficient: in order to measure the sincerity of the study the study tools.

3. Pearson correlation coefficient: In order to know the sincerity of the internal consistency of the terms of study for the total axes of these phrases, as well as to know the relationship between the independent variable of applications of informational management dimensions with the dependent variable of the performance of the academy under study.

4. Skewness and kurtosis coefficients: In order to find out whether the data of the study follow the normal distribution or not.

5. Frequencies and percentages: To describe the sample of the study according to their functional characteristics, in addition to frequencies and percentages for each of the statements of the themes of the study.

6. Arithmetic mean: To know the attitudes of the study sample towards each axis of the questionnaire, and to rank phrases in terms of the degree of response according to the highest arithmetic average.

7. Standard Deviation: To identify the degree of dispersion of the study sample responses for each of the variables of the study variables and for each of the main axes of the questionnaire on its arithmetic mean and was used to arrange phrases with equal arithmetic average in favor of the least dispersion.

8. One-way Anova: which is usually used to explain phenomena, by determining dependent variable interpreted by another variable, where the null hypothesis and the alternative hypothesis are determined, and the statistical value of Fisher (F) and the significance level are used to test the validity of these hypotheses. If the significance value of the phenomenon under test is greater than the statistical significance level which we accept ($\alpha = 0.05$). The null hypothesis is accepted, i.e. there are no statistically significant differences between the two variables under study.

For this study, a single variance analysis was used to determine whether there were statistically significant differences between the responses of the study sample on the level of adoption of information management applications as well as the performance level of the Algerian universities under study, which is due to the functional variables of: Years of university experience, educational qualification, grade).

9. Analysis of Variance: To identify the suitability of the study model to test the study hypotheses.

10. Sample Regression: It is used to determine how one independent variable affects one dependent variable.

11. Stepwise Regression: It is used to exclude independent variables that do not contribute to the interpretation of the dependent variable, or those whose level of influence is weak in the presence of the rest of the elements where this method is introduced, (Stepwise Regression), by following the method of independent variables to the equation regression on steps so that The independent variable with the strongest correlation is entered with the dependent variable provided that the correlation is statistically significant (fulfills the requirement to enter the regression equation). In the following steps, the independent variable with the highest partial correlation is statistically significant with the dependent variable after excluding the effect of the variables. I entered the equation, and then examined the variables in the regression equation whether it still fulfills the condition of survival in the regression equation.

THE THIRD REQUIREMENT: COMMUNITY AND SAMPLE STUDY

Through this requirement, community will be introduced to the study, in addition to clarifying the mechanism by which the sample size was determined.

First: study community

The study community is what the researcher wants to reach the results of the study, or in other words the group of individuals, organizations, or all units to which the study can be applied [27]. The target community is to determine the type of units considered as elements of the studied community, which are limited to the study [28].

For this study, the target community is all deans of faculties, heads of scientific departments and their assistants at the university under study.

Second: the study sample

The sample is defined as: "It is a partial group of the study population that is chosen in a certain way. The study is conducted on it, and then the results are used and circulated to the entire original study community."

As for the sample size, many studies and studies have shown that if the study population consists of hundreds or thousands of units, it is better for the study sample to be represented by 10, the larger the sample size the better the results of the study. In order to determine the sample size for this study based on the specific community in the academy, which is about 120-person, Taro Yamane equation will be used, given that the aim of the study is to generalize, this equation is written according to the following formula:

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

Where: Sample size: n, and Community size: N

Accuracy level: where the greater the error, the greater the sampling error. In the study, 5% is accepted as a sampling error, e. The confidence level is estimated at 95% (i.e. among 100 assessed values, 95 give an estimated value that is very close to or equal to the actual value of the study population).

Applying the above equation, the minimum sample size can be estimated as follows:

$$n = \frac{N}{1 + N(e)^2} = \frac{120}{1 + 120(0.05)^2} = 92 \, person$$

Based on the result obtained, it can be said that the minimum sample size is 92 individuals, and the larger the size, larger than this value, the better to represent it for the studied population.

Regarding to this study, the researcher was keen to ensure the randomness of the selected sample to ensure its proper representation of the society from which it was taken. Out of a total of 120 questionnaires distributed to study researchers, only 99 of them were retrieved, with a total recovery rate of approximately 82%.

Fourth requirement: The validity and reliability test of the study tool

Through this requirement, the validity and reliability of the study tool, represented in the questionnaire, which was finally completed by relying on a group of arbitrators, will be verified.

First: validate the questionnaire

The truthfulness of the questionnaire is intended to ensure that it will measure the variables that have been prepared to measure them, meaning the ability of the test as a whole to measure a variable in all its aspects, and the researcher has made sure of this through the following types of honesty, which are:

- **Truthfulness of the content or apparent honesty:**
means the validity of the vocabulary of the test and its correlation with the measured variable and its representation of all aspects that are supposed to be measured in variable [29]. For everyone who uses it.

The validity of the questionnaire has been confirmed through the validity of the content and ANT previously discussed concept, by presenting it to a group of arbitrators to express their opinions and observations on the following aspects:

1. Accuracy and integrity of the linguistic wording of the phrases;
2. the suitability of each phrase for the axis to which it belongs;
3. The adequacy and comprehensiveness of the terms;
4. Propose any amendment or change that they deem appropriate.

And based on the arbitrators 'observations and suggestions, which focused in their entirety on the need to reduce and delete Some phrases from some axes, in addition to amending the wording of some phrases in terms of construction and language, the researcher made the adjustments that most arbitrators agreed to make the questionnaire in its semi-final form.

- Validity of the criterion:
To make sure that the questionnaire is valid for measuring what it aims to measure, the "Validity of the criterion" parameter was calculated by taking the square root of the stability factor "Alpha Cronbach", which will be discussed later, where the validity factor of the criterion was for all variables, whether main or sub Above the required rate (0.6) as shown in Table No. (3), which indicates that the questionnaire is valid for measuring what is designed to measure it.

Table No. (3): Verification of the criterion for the axes and dimensions of the study

Axes / Dimensions	Axis name/ Dimension	Number of phrases	Verification of the criterion
The first partial dimension	Information management applications in the field of administrative activities	20	0,95
The second partial dimension	Informational management applications in the field of educational activities	10	0,93
The third partial dimension	Information management applications in the field of office activities	10	0,91
The first axis	Informational management applications	40	0,97
The second axis	the performance	14	0,94
The questionnaire as a whole		54	0,97

Source: Prepared by the researcher

Second: consistency of the questionnaire

The consistency of the questionnaire means the possibility of obtaining the same results if it is re-applied or distributed to the same individuals, in other words, whether the questionnaire is valid for study again in the same circumstances, and one of the most important methods used to measure the degree of stability of the questionnaire is the method of Cronbach's Alpha, where It is used to measure the degree of stability in terms of internal consistency of questionnaire phrases. In order for the questionnaire to have stability, the alpha Kronbach coefficient must be equal to the required rate (0.7) or greater than it, and the more the stability factor approaches one, the more the questionnaire will have greater stability, but if the stability coefficient is less than (0.6), this indicates that There is stability in the data, which necessitates reformulating and distributing the phrases again, and ensuring that the study subjects are more serious in answering the questionnaire questions.

For this study and in order to verify the reliability of the questionnaire, the value of the Cronbach's Alpha parameter was calculated for each of its axes, and the results were as shown in the following table:

Table No. (4): The values of the Alpha Cronbach coefficient for the study axes

Axes / Dimensions	Axis name/ Dimension	Number of phrases	Cronbach's Alpha
The first partial dimension	Information management applications in the field of administrative activities	20	0,90
The second partial dimension	Informational management applications in the field of educational activities	10	0,84
The third partial dimension	Information management applications in the field of office activities	10	0,89
The first axis	Informational management applications	40	0,95
The second axis	the performance	14	0,92
The questionnaire (All axes).		54	0,96

Source: Statistical Program Outputs SPSS. V22

It is evident from the data of Table No. (4) that all values of the Alpha Cronbach coefficient for all the axes of the questionnaire are greater than the required rate (0.7), while the stability coefficient of the questionnaire as a whole has reached (0.964), a value that falls in the very high range, which indicates the stability Questionnaire questions and their validity in data analysis, and after confirming the validity and reliability of the questionnaire, the questionnaire was designed in its final form.

Three: Normal Distribution Test

Before analyzing the results of the questionnaire, it is necessary to know whether the data are subject to the natural distribution or not, as the natural distribution is considered one of the most important assumptions in the statistical tests, and it is one of the most important distributions in statistics science, but rather it is the basis for many mathematical statistical theories, as it plays a role Important in testing assumptions and confidence intervals.

To ensure that the data follow the normal distribution, a set of tests is used, including the skewness test and kurtosis. When performing these two tests, the skewness test must be confined between the values (-1) and (+ 1), and kurtosis is limited to between (-3) and (+3). For this study, skewness and kurtosis were calculated as shown in Table 5:

Table No. (5): normal distribution test.

Axes / Dimensions	Axis name/ Dimension	(skewness)	(kurtosis)
The first partial dimension	Information management applications in the field of administrative activities	-0,98	2,3
The second partial dimension	Informational management applications in the field of educational activities	-0,26	0,8
The third partial dimension	Information management applications in the field of office activities	-0,54	0,9
The first axis	Informational management applications	-0,73	1,5
The second axis	the performance	-0,94	2,2

Source: Statistical Program Outputs SPSS. V22

CONCLUSIONS

It is clear from the above table that the values of (skewness) were all negative, and they ranged Between (-0.96) and (-0.25), these values are between (-1) and (+1). As for the values of (kurtosis) for all axes and dimensions, they were all positive and ranged between (+0.80) and (+2.3), which are It is also between (-3) and (+3), which indicates that the study data follow the normal distribution. In the context of accelerated shifts and increasing interest in information management and the development of tools of collection and storage and processing and dissemination of information and means of communication and coordination between the institutional units within and outside the institution with other institutions, and increased attention to information and communication technologies In the external environment it is influenced by the presence of forces that reject change.

Through the field study that was carried out at the level of the Libyan Academy for Graduate Studies, and after analyzing the results of the interview and the questionnaire and examining the study hypotheses, the results reached showed that the attitudes of the study sample individuals on the level of information management based on ANT application in the Libyan Academy for Graduate Studies is stable at the intermediate level, despite the attention that the latter attaches to information managementapplications, but it remains insufficient, as well as the results showed that there is an average level of performance of the Libyan Academy for Graduate Studies under study, where the answers of the members of the study sample were medium according to the study scale, also the results confirmed The presence of a statistically significant relationship at the significance level (0.05) highlights the contribution of informational managementapplications in their three dimensions to developing the performance of the Libyan Academy for Graduate Studies under study.

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