Analysis of Role of Cloud Computing in Providing Internet Banking Services: Case Study Bank Melli Iran

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P A P E R I N F O	*A B S T R A C T*
	In this paper, the cloud-computing model proposed by Davis has been used to explain the main parameters of cloud computing by the use of information systems. This paper investigates influential factors in decision to use cloud computing among employees of the national bank information technology organization based on the cloud-computing model. To analyze and investigate the use of cloud computing in national bank services, the designed questionnaire was distributed among 230 experts and acquainted with the information technology industry in the national bank information technology organization; which resulted in the questionnaire's Cronbach's alpha 0.84. After conducting exploratory and confirmatory factor analysis with regard to analytical coefficents, utility factors were proved to have the most critical influence on the decision of using cloud computing in the electronic banking system. The findings of this research can be considered as guidelines used by national bank managers to employ cloud computing technology.

1. INTRODUCTION

Information and communications technology (ICT) is an integral part of business processes that affect the delivery and performance of business operations [1]. Therefore, companies and banks spend a large amount of their budget on purchasing and maintaining ICT infrastructure. Business needs never stay there; they tend to shrink and grow [2]. But ICT infrastructure is usually designed to be able to respond to demand in peak hours of consumption. Therefore, considerable investments have been made in the launch of ICT hardware and software [3-5]. Frequent improvements in technology have introduced the trend to build existing hardware and software. Companies spend a lot of money on the ICT infrastructure, which is not particularly practical for small businesses. ICT departments need to focus more on the daily activities related to ICT rather than focusing on core activities. On the other hand, banks also need to minimize the costs of electronic banking and financial services. The primary purpose of this study is examining the reasons for the use of cloud services in electronic

banking in the context of National Bank of Iran, one of the largest banks in Iran. The results can be used by senior managers of the Bank for making descioin about the use of cloud computing technologies. Cloud computing refers to the delivery of information technology (IT) resources as services via the internet, contrary to hosting and operating these resources locally based on subscription or payments [6]. John McCarthy in 1961 stated that "calculations may someday be organized as an auxiliary tool" [7]. His prediction was realized with an increase in the network speed and reliability of the Internet. Cloud computing allows people to use it to compute, store and network in exchange for payment, which is similar to the method used in electric and telephone services used in the everyday world. Many other technologies such as distributed computation, virtualization, grid computing, and auxiliary computation have also been developed to evolve cloud computing. According to the National Institute of Standards and Technology (NIST), cloud computing is a model for enabling the network to be able to provide a common repository of configured computational resources (such

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as networks, servers, storage, applications, and services) that can be quick and have the minimum management or service provider effort [8].

Cloud computing is developed according to the structure, platform, and application as service-based services in a model as cost payments for users [9, 10]. In the industry, these services exist as Infrastructure as a Service (IaaS), Platform as Service (PaaS), and Software as a Service (SaaS), respectively [11, 12]. In e-banking, it is also the structure of providing different services and services based on various services in electronic banking, which can be significantly enhanced using cloud technology infrastructure.

The main objective of this paper is to explore the problems that are the main root of the lack of a cloud-focused banking system. The remaining of the paper are organized as the following parts. In the second part, the frameworks for using cloud computing are introduced.

2. THE USE OF CLOUD COMPUTING

Today, information technology is a crucial tool in promoting countries' economic competitiveness. Currently, its usage has significant implications on the productivity of organizations. These effects can only be realized if IT capabilities are widely used; therefore, several theoretical models are proposed at the individual and organizational level for the use of cloud computing [13, 14].

2. 1. UCCTAM Model of Cloud Computing   The UCCTAM model introduced in 2015 is a widely used theory for individual acceptance of an information system and information management [15]. Most studies focus on users' reception positions in choosing or not using freedom technology [16]. This study is successfully used to predict the use of cloud computing technology by new systems [17]. In addition, research aimed to investigate the effect of customers' trust on Internet banking acceptance based on the UCCTAM model [18]. Based on this model, the utility factor and ease of use are the key factors determining the efficiency of technology.

2. 2. Experimental History of Research   Many pieces of research have been developed to identify the main parameters of cloud computing. Kamankesh and Hamidi [19] have suggested that the adoption and use of cloud computing have been studied among almost 750 students of local colleges enrolled in basic arithmetic courses. This study investigated factors such as software access, ease of traffic, personal creativity, concern of technology, teacher support, and reliability as main parameters on utility factor, ease of use, actual use, and future profitability. The results of path analysis indicate that two elements, including profitability and ease of use,

have a positive effect on the decision-making use of cloud computing. In contrast, the ease of use factor is more effective due to the negative effect of factors such as concern of technology, access to software, and convenience of traffic on factor. It has no significant impact on the use of cloud computing.

Alvanchi et al. [20] investigated the adoption of cloud computing applications among 209 librarians of the Central Libraries of Tunisia. In this study, which was survey type and data collection method during 11 months, the author emphasizes the effect of four factors of usefulness, ease of use, attitude towards the use and decision making of cloud computing applications. Due to the results of this study, there is a significant relationship between productivity factor and attitude factor toward the use of librarians as well as the factor of attitude toward the use of cloud computing applications, and there is only a significant relationship between the factor of ease of use with profitability factor and attitude toward usage.

Research studies are based on a conceptual model. The conceptual model indicates the desired variables in an investigation and the relationship between them. In this research, a cloud computing model is used as a model for various research fields. In this model , four factors, namely, utility, ease of use, attitude towards use, and decision using cloud computing technology, are considered. Figure 1 shows the conceptual model used in this study.

Thus, the present study is conducted based on three hypotheses as follows:

The first hypothesis: the decision element to use cloud computing is influenced by attitude towards the use of cloud computing, ease of use, and utility factors.

The second hypothesis: attitude factor towards the use of cloud computing is affected by ease of use and usefulness factors.

The third hypothesis: the effect of usefulness is affected by ease of use.

3. RESEARCH METHODOLOGY

The purpose of this paper is to investigate individual factors associated with cloud computing among IT
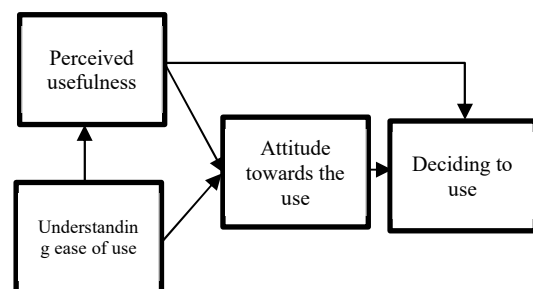

Figure 1. Conceptual model of research

professionals in the field of electronic banking at the National Bank of Iran. Hence, this study can be classified as a descriptive survey. We provided a questionnaire for collecting data. In order to validate the questionnaire, an initial version of it was presented to academic researchers, cloud computing professionals working at the national bank of Iran's technology organization (SADAD) and top level executives of SADAD. After applying necessary reforms to the questionnaire, the sectors in the questionnaire were designed and the questions related to each section are based on elements of the "cloud computing model" used in this study. The questions of this questionnaire include 17 closed questions, apart from questions related to general specifications. To determine the reliability of the measurement instrument, the final questionnaire was distributed randomly between 10 individuals from the research population, and the alpha coefficient of the questionnaire was calculated using the SPSS software, and a Cronbach's value of 0.84 was obtained. Considering that the reliability of this survey exceeds 70 %, it can be inferred that the questionnaire has a relatively high reliability. The research population of this study consists of 230 employees and managers working in the IT sector of the National Bank of Iran. Hence, 230 questionnaires were prepared and distributed among the demographic society, a well-known target society associated with cloud computing technology. Among 230 questionnaires, 209 questionnaires were returned and analyzed. In this study, descriptive and inferential statistical methods have been used. In order to understand the existence of meaningful relationships between the independent and dependent variables, the correlation analysis method is operated using the "spearman" statistic. For statistical analysis, exploratory factor analysis methods, confirmatory factor analysis, and path analysis were used. Statistical analysis of the research data was carried out using SPSS software and Amos software.

3. 1. Reliability and Validity
After data collection, the validity and reliability of the collected data must be inspected.

Validity: the validity of a research method refers to how accurately it is able to measure what it is intended to measure.

Reliability: The ability to replicate the method or instrument of measurement. If there is no reliability method, the Collecting data will not have validity as well [21].

3. 2. Validity and Reliability of Research Tools

3. 2. 1. Validity
Content validity is the validation method commonly used to examine the components of a measurement instrument. The content validity of a measurement tool depends on its constituent questions. The test has content validity if the instrument's questions define specific traits and skills that the researcher intends to measure.

3 .2. 2. Reliability
Reliability or credit is one of the technical characteristics of measurement. The concept has to deal with this when the measuring instrument in the same condition achieves the same results. The objective of reliability is that if the measuring processs is carried out several times in a short interval of time and with a single group of people, the results are expected to be close to each other. We use an index called "reliability coefficient" to measure the reliability, and its size usually varies between Zero and One. "Zero" reliability factor defines the reliability, and the reliability factor "One" is representative of the validity [22, 23]. There are several ways to determine the reliability of the measurement instrument, such as the repeat method, the Tasnif method, Kord Richardson method, and Cronbach "s alpha.

$$r_\alpha = \frac{j}{(j-1)}[1 - \frac{\sum_{j=1}^{k} S_j^2}{S^2}] \qquad (1)$$

Relationship 1: Cronbach "s alpha calculation formula
In which the number of questions of questionnaire: j

The variance of the scores on each subset: S_j^2
Total variance: S^2

Typically, a Cronbach "s alpha value between 0.6 and 0.8 is acceptable, and a value higher than 0.8 indicates high reliability. It is evident that the closer the number is to one, the better. In this study, Cronbach "s alpha technique is used to determine the reliability of the questionnaire.

Most of the research is based on the questionnaire in humanities and behavioral sciences. The quality control issue of the results of a questionnaire includes a wide range of topics. If we assume the questionnaire as a test, a good test should have good qualities such as objectivity, ease of implementation, feasibility, interpretation, and image to achieve good results. Among these features, validity and reliability are more important [24]. Given below is the Cronbach's alpha that is more prevalent than other methods:

The method of using Cronbach's alpha coefficient to determine the reliability of a questionnaire or test by emphasizing internal correlation can be used. In this method, one or more parts of the questionnaire are used to measure the reliability coefficient of the test. If the questions are expressed in two cases, True =one or False= zero. The Alpha coefficient is calculated from Relationship (2):

$$\alpha = \frac{k}{(K-1)}[1 - \frac{\sum_{i=1}^{k} pq}{S^2}] \qquad (2)$$

Relationship 2: Cronbach "s alpha coefficient

where "K" is the number of questions, "p" is the number of correct responses, "q" is the number of wrong answers and the total variance of the questions (and if the questions are worth the value), each question has its own value (Cronbach "s alpha from the following equation calculates the reliability of the test:

$$\alpha = \frac{k}{(K-1)}\left[1 - \frac{\sum_{i=1}^{k} S_i^2}{S^2}\right] \qquad (3)$$

Relationship 3: The reliability of the test
where "k" is the number of questions, the variance of each question, and "S^2" is the variance of the whole question. Reliability of the questionnaire: Since a questionnaire is a questionnaire with several questions (such as a five-point Likert scale) such as a test, the high correlation can be calculated by Cronbach's alpha [24, 25]. Cronbach "s alpha method can be used not only for two zero and one value options but also for multi-value options (such as a five-point Likert scale). If the test parts or the tests that are made out of the total of them are individually, then the Alpha factor does not require that individual questions be correctly and incorrectly [22]. To further explain how to use the alpha coefficient, suppose a questionnaire is designed to test the three hypotheses that the questions pertaining to each hypothesis are considered a little test.

Suppose the variance of three little tests is equal to:
$S^2_3 = 7$ and $S^2_2 = 4$ and $S^2_1 = 6$, and the total variance of the test is equal to 33 due to k = 3, the Cronbach "s alpha coefficient is calculated as Formula 4.

$$\alpha = \frac{k}{(K-1)}\left[1 - \frac{\sum_{i=1}^{k} S_i^2}{S^2}\right] = \frac{3}{(3-1)}\left[1 - \frac{6+4+7}{32}\right] = 0.7 \qquad (4)$$

Relationship 4: Calculation of Cronbach "s alpha coefficient

It is said that if the alpha coefficient is more than 0.7, the test has acceptable validity. As a result, the above test has acceptable validity.

4. RESEARCH FINDINGS

The data obtained from the research questionnaires were presented in the following three subsections:

4. 1. The Description of the Research Community
From the analysis of 209 questionnaires in this study, it was found that men (56%) had more participation than women (44%). In terms of the job situation, information technology industry experts have the highest number of respondents (79%). In terms of the work area, most respondents were active in the hardware and network domains (37%). The highest rate of work between 5 and 10 years (35%) and the highest level of education was related to the expert group (57%). Most of the

participants were in the computer engineering survey (52%), and others had other documents [13].

4. 2. Exploratory Factor Analysis of the Research Variables
Since four factors are introduced as influential factors of cloud computing in this research, separate factor analysis has been done for each of these factors, and the results are shown in Table 1. The first row is the number of variables related to each factor. The second row defines the "KMO" test value, which is one of the prerequisites for first conducting an exploratory factor analysis. Since the "KMO" value is for all factors above 0.5, the variables are suitable for factor analysis. The third row represents a significant number of the Bartlett test, which is another prerequisite for exploratory analysis. The fourth row "Share number" show commonalities. It examines suitability of questions in each exploratory factor. If the Share number is at least 0.5, the indicators are accepted [14]. In this part, after removing inappropriate questions, the number of factors was larger than 0.5. Thus, the above questions have appropriate validity for factor analysis. Having a higher quality and special value above 0.5, stated in the fifth and sixth lines, the appropriateness of questions is a confirmation factor analysis.

4. 3. Confirmatory Factor Analysis of the Research Variables
In order to perform a confirmatory factor analysis, Imos software was used. The fit indices of the model are shown in Table 2. The results from Table 2 indicate that all fit indices are acceptable. In this paper, the proposed model is used to model the fitness indices of the model concerning all vegetation indices of the model. In other words, the observed data were primarily based on the conceptual model of the research.

5. DISCUSSION

The correlation matrix is the basis of the analysis of causal models. In this study, the correlation matrix has

TABLE 1. Results from the exploratory factor analysis of the research variables

Variable	Factor of use	Ease of use	Attitude towards the use	Deciding to use
Variable number	4	5	2	3
KMO Test	0.745	0.657	0.500	0.677
Bartlett Test	0.000	0.000	0.000	0.000
Share number	0.986	0.980	0.991	0.996
Operating loads	0.711-0.784	0.621 – 0.736	0.794	0.770 - 0.846
Special values	2.327	1.842	1.261	2.011

TABLE 2. Performance indices of the model

| Index	Estimation	Acceptable fitness criterion
Squared K	3.345--- P=0.067	<1-----P>0.05
Index of Comparative elegance	0.946	0.90>
smooth index of excellence	0.933	0.90>
Root mean residual	0.014	<0.05
Squared Root variance of approximation error	0.106	<0.10
Necessary index of fit	0.992	>0.90
Adjustable index of fit	0.920	>0.85

been used to analyze the meaningful relationship between the research variables, and the results are presented in Table 3.

According to the result obtained from Table 3, we can say that there is a positive relationship between all research variables with a confidence of 99 percent. This result matches the results of the survey in literature [25]. Analyzing the results in terms of model path coefficients, this section of the research variables using Imos software was tested using the statistical method analysis technique using the general least squares method. Path analysis is one of the multivariate analysis methods, which, in addition to investigating the direct effects of independent and dependent variables, considers their indirect effects.

The researcher conducted by Naghsh Nilchia and, Vafaei [16] believed that the path coefficients between each of the questions and factors, if meaningful, are the reason for initial convergence in the research tool. Due to the positive effect of all the path coefficients obtained in Figure 2, we can conclude that there is an increasing relationship between all research variables. The contribution of the usefulness factor in attitude towards the use is much higher than the contribution of ease of use. Table 4 shows the direct, indirect effect, and the total effect of independent variables on the dependent variable

TABLE 3. correlation matrix of the research variables

Variable	Operating factor	Ease of use	Attitude towards the use	Deciding to use
Operating factor	1			
Ease of use	0.227**	1		
Attitude towards the use	0.336**	0.202**	1	
Deciding to use	0.396**	0.231**	0.260**	1
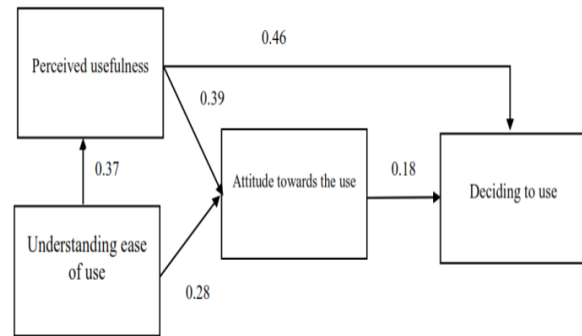
Figure 2. Path coefficients of the conceptual research model

TABLE 4. Direct and indirect effect and the total effect of variables on the decision variable

Variables	Straight effect	The effect is not straight	Whole effect
Operating factor	0.46	0.70	0.53
Ease of use	–	0.011	0.050
Attitude towards using	0.18	–	0.18

(the decision to use cloud computing). Due to the direct and indirect effect and the total effect of research variables on the decision to use cloud-computing technology, the variable factor has the most significant impact on the decision variable. Attitude variables are used for use and ease of use in the next rankings; therefore, the decision variable using cloud computing is influenced by the variable factor variables, ease of use, and attitude towards the use of cloud computing. However, the first hypothesis is confirmed.

The second hypothesis examines the effect of two utility factors and ease of use on the attitude variable.

According to the results of the total effect of productivity factor and ease of use in Table 5 on the attitude variable relative to the use, the second hypothesis is confirmed. It can be concluded that the variable effect is more effective than the variable of ease of use. The third hypothesis examines the ease of use on the usefulness factor. Due to the positive correlation between the two variable factors and ease of use, the third hypothesis is confirmed.

TABLE 5. Direct and indirect effect and the total effect of variables on the attitude variable

Variables	Straight effect	The effect is not straight	Whole effect
Operating factor	2.33	–	2.33
Ease of use	2.26	2.54	2.54

6. CONCLUSION

Cloud computing has many advantages, this paper investigates influential factors in the decision to use cloud computing among employees of the national bank information technology organization based on the cloud-computing model. As the results of this study show, there is a significant relationship between utility factors and attitude toward usage. While the relationship between agents is the ease of use and attitude towards the use of other relationships, the result is consistent with the results of the studies in literature. The results of the analysis show that the utility factor has the most significant impact on the decision-making use of cloud computing technology. After the utility factor, attitude factors are used to make use and ease of use in order to influence the decision to use in the next rankings. Due to the novelty of cloud computing technology in Iran, the results of this study are completely consistent with the predictions. Senior managers of the National Bank have to promote the level of knowledge of users about familiarity with cloud computing and deployment. The level of knowledge of users about information systems can affect users' ease of use and thus influences attitude factors toward using cloud computing technology. This study shows a correlation between ease of use and attitude towards other relationships. Another factor affecting this result is employees' resistance in applying new technologies and adjusting them to traditional methods; therefore, before launching new technologies such as cloud computing, employee culture is used in using these technologies, to which managers need to pay attention. Cloud computing requires training and, more importantly, continuous support to remove barriers and problems. In other words, support mechanisms are decisive factors in the application of this technology. The findings of this study can be effective on the application of cloud computing in the national bank for the managers of the national bank. For future research, in addition to individual factors, other main factors such as environmental factors, technical factors, organizational factors should be considered in the use of cloud computing in e-banking.

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Persian Abstract

چکیده

با توجه به گسترش روزافزون استفاده از رایانش ابری به عنوان الگوی جدید ارتباطی در سازمان‌ها، تحلیل رفتار کاربران در مواجهه با این فناوری در هر یک از سازمان‌های استفاده کننده ضروری است. در این مقاله، مدل استفاده رایانش ابری که توسط دیویس ارائه شده است، برای تبیین پارامترهای اصلی براستفاده رایانش ابری توسط کاربران سیستم‌های اطلاعاتی مورد استفاده قرارگرفته است. هدف اصلی این مقاله بررسی مشکلاتی است که ریشهدر عدم استقرار سیستم بانکداری متمرکز ابری دارد. نتایج حاصل از تحلیل ها نشان می‌دهد که عامل سودمندی بیشترین تأثیر را بر تصمیم به استفاده از فناوری رایانش ابری دارد. پس از عامل سودمندی، عوامل نگرش نسبت به استفاده و سهولت استفاده به ترتیب اهمیت اثرگذارتری دارند. یافته‌های این پژوهش می‌تواند به عنوان راهنمایی کاربردی مورد استفاده مدیران بانک ملی در جهت تصمیم گیری در استفاده از فناوری رایانش ابری قرار گیرد.