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Research paper



Organization Support for Cloud Computing Implementation Success in Education System: Scale Development and Validity in Delphi

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Abstract

Cloud computing (CC) support for learning systems has been viewed as one of the most discussed issues that promise to modernize computing by providing visualized resources as a service over the internet. To be stable in cloud computing acquisition requires an education institution to address many of the same concerns they face in implementing an Information System (IS) service. Currently, there is still lack of CC implementation standard and organizational support that impacted VLE system performance. Previous research has reported that the influence of the CC implementation decision depends on the impact of various factors studied. Nonetheless, organizational support is the least factor mentioned especially studies from Malaysia. Thus, the main purpose of this study is to develop a validated scale of organizational support in implementation decision activities towards CC implementation success. In this paper, the Delphi process adopted to measure consensus among nominal group technique (also known as the expert panel). Key methodological issues in using the methods are discussed, along with the distinct contribution of consensus methods as aids to decision making in education service development. The study has adapted stages of proses flow of scale development and validation of measurement items according to legitimate measures in the Delphi technique. The measurement scales formed are based on literature review and field studies conducted to increase the reliability and validity values. Organizational support constructs were divided into top management support, firm size, awareness, Technology Readiness and cost effectiveness. A total of 5 items have been successfully set up for further validation.

Keywords: *Cloud Computing; Visualized; Organization Support; VLE*

1. Introduction

Cloud computing is a new paradigm in the implementation of IT resources and business services. It allows users to get vital supplies they need, from business applications to meet the IT infrastructure, including storage of virtual database. This technology could provide significant economies of scale and business agility in a big drought in addition to accelerating the innovation process. Organizations with cloud computing service are not managing its IT infrastructure, but deliver it to the service provider and use computing resources as required. The difficulties in managing IT infrastructure are handed over to the experts, and the organization would be more focus on their core business of delivering value. This study will discuss the overview of the cloud computing service to support e-management and e-contents activities. In this paper the key driver of cloud computing implementation will be discussed, emphasizing its potential benefit that would have a significant impact on the organization environment in the future. In this research, a conceptual framework will be proposed as a reference to moving to the cloud computing technology.

2. Literature Review

2.1. Development of Critical Success Factors (CSF) constructs

CSFs are important (Factors) that must closely monitor to ensure the continuity and success of the organization. The CSF approach for the planning of IT has been developed to help identify managers' information requirements managers (1). Developing a Critical Success Factor (CSF) has been an effective management tool used by the business community for decades to ensure that organizational objectives are met. This concept is to determine the real, achievable, and measurable CSF in which decisions are made. The concept of CSF became popular by (2–7). Many Researchers began utilized the concept of Critical Success Factors for various sectors other than business, including healthcare and education.

2.2 Defining Consensus and Consensus Methods

Quantitative methods have been developed to provide a statistical picture of the test results and the exact results of the published subjects. The consensus method is another way of dealing with conflicting scientific reasons. They allow a broader range of fields of study to be considered than usual in statistical revaluation. In

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addition, they allowed a larger role for qualitative evidence (Box I) evidence. This method, not as described in other papers in this series, is primarily concerned with quantitative estimates of derivatives through a qualitative approach.

Box 1: Features of consensus methods

Anonymity	To avoid mastery; achieved by using a questionnaire in Delphi and a personal position in the nominal group
Iteration	The process occurs in a "round", allowing people to change their opinions
Controlled feedback	Shows distribution of group responses (showing each individual an earlier response in Delphi)
Statistical group response	Express the judgment using the full set of response summaries, giving more information than just an opinion statement
Adapted from (8)	

The purpose of the consensus method is to determine the extent to which experts or the public agree on the issue. They strive to overcome some of the disadvantages normally found by making decisions in groups or committees, which are usually dominated by one individual or by a coalition representing the interests of interest. In an open committee, individuals are often unwilling to retract long and open opinions, although this has proven to be wrong. The term "agreement" takes two forms, which need to be distinguished: first, to what extent each respondent agrees with the issues being considered (usually evaluated on a numerical scale or category) and, secondly, to what extent respondents agree with each other, (usually assessed by average statistical measurements and diffusion).

2.3 Generate Item to Represent the Construct

After defining the main construct, the second stage is the development of measures. The set of items will be generated to represent the construct and the contents will be validated. The item should represent the domain construct and will be getting from many sources. Based on the previous study that focuses on the similar topic, they mentioned four things to increase knowledge transfer activities in the organization include, high support from top management, good cooperation between the department, do system training for the end user and always communicate about the system requirement by increasing the communication channel. Refer table 1.

Table 1: Factor Analysis

CSFs /Authors	Cost Effectiveness	Firm Size	Awareness	Technology Readiness	Top Management Support
(9)	□				
(10)					□
(11)	□		□		□
(12)	□		□		□
(13)	□		□		
(14)				□	□
(15)		□	□		□
(16)	□				
(17)	□				
(18)	□				
(19)					□
(20)		□			
(21)		□			
(22)	□		□		□
(23)		□			□
(24)			□		
(25)	□			□	
(26)					□
(27)				□	□
(28)	□				
(29)		□		□	
(30)	□	□			□
(31)				□	□
(32)	□				
(33)	□	□	□	□	□

Based on Table 2, it shows out of 26 journals, most of them agree that Top Management Support and cost-effectiveness are the most influential factor for technology implementation towards CC success, and firm Size, awareness, and technology readiness has a medium level of agreement. Thus all three factors will be selected as sub-construct of the study.

3. Methodology

3.1. Delphi Technique

Delphi's method is a combination of qualitative and quantitative processes that assess the views of experts identified to develop theories and projections for the future. A group of experts is drawn from several fields and professions. Multiple survey systems have been administered to this group over a long period of time. The aim of this method is to reach an agreement among the groups at the end of this double questionnaire process. The privilege of Delphi lies in its reliability, in view of the diversity of human opinions, and its ability to be administered remotely and without direct participant interaction. It is best used for fairly simple assessment of new products and developments, but it is one of the most complicated methodologies available.

There are two ways to make the first questionnaire. The first is through a research team composing ideas after studying the literature and the second by offering expert panels a series of open options to get their opinions (34). The first questionnaire for our Delphi is based on the outcome of the initial phase of the study and planning meetings with TVET vendors and technologies. The sequence of the Delphi process is detailed in Table 2.

Table 2: Delphi process

Stages	Description
Step 1: Definition of Problems	• What is the determining of cloud computing success? • How the elements emphasis influents the cloud computing success
Step 2: Factor Analysis	• Exploration to reduce the set of items • Validation to test the importance of scale
Step 3: Questionnaire Administration (Interview questions and scale development)	Create an item Determine the scale of the item. Determine sufficient sample size Manage questions with other predetermined steps Internal Consistency Assessment Determine scale reliability (Participants sign the agreement or disagree with the fact on a scale from 1 (Most important) to 7 (Very important).
Step 4: Selection of Experts	Consulting expert opinions Practitioner Technology vendors Academicians
Step 5: The first round data collection	Interview to develop an Initial list Interview to get opinions categorized under common headings Questionnaire distribute through online and face to face to all identified experts
	First data analysis Responses analyzed for agreement and

	consensus. Opinion/factors from interview added to the current items
Step 6: Redistribute questionnaire	Data, not consensus Repeat questionnaire identical to first but incorporating second-round responses distributed to second round respondents. Construct validity
Step 6: Result analyzed	Participants score agreement or disagreement in light of groups responses Agreement and degree of consensus. Repeat data collection until consensus reached or response too low.
	Report finding Test result against the real situation

4. Finding

4.1. Develop a Conceptual Definition of the Construct

The main focus of Top Management Support is to provide necessary resources to the cloud computing success. At the same time, cost or budget also important to ensure all resources and servicer setup properly. Awareness and technology readiness were critical items which help the HTVET understand the knowledge and function of the system and able to give correct information when needed. Firm size involved the total of staff and capacity data activities in the company. The full definition of the sub-construct will be mention in table 3.

Table 3: Operationalization of Main Construct

Main Constructs	Sub constructs	Sub-construct definition
Organization Support	Cost	Cloud computing is the capability to pay for service, based on needs, avoiding the large expenses for computer systems and infrastructure purchases for software, networking, and servers.
	Size of institutions	Size of the institute is based on the total of the employee, revenue, and investment. The socially optimal firm size is the size of a company in a given industry at a given time which results in the lowest production costs per unit of output.
	Technology Awareness	Technology trend awareness as a skill refers to being mindful of the technology that is recently becoming popular and is readily accepted in the market or industry. It also encompasses one's ability to recognize and understand the usefulness of any such technology for the success of the business.
	Technology Readiness	The technology readiness to implement new technology requires a deep understanding of the technology and the factors implementation that drive the organization to make the decision to implement new technology.
	Top Management Support	Support from top management is the degree to which senior management understands the importance of the CC-L and the extent to which it is involved in Information System activities.

As with other management disciplines, the IT implementation literature has also identified the role of top management support in initiating, implementing and utilizing some of the information technology (Goel & Yang, 2015). As a research by Rahimah & Aziati, (2017) resulted in the highest management support being an important factor in the implementation of cloud computing. According to them, the readiness of top management to understand the benefits associated with cloud computing business and competitiveness, and to implement it in the organization is also important. Thus, IT top management is responsible for prepare their employees the knowledge matters of cloud computing so that it can be effectively implemented in the organization and to improve their performance to achieve business goals (Alkhanak, Lee, & Khan, 2015). The cost is required as an important issue in implementing cloud computing technology within an organization. Cloud computing offers rented services on a fee basis that is used to adjust the level of usage according to the organization's current needs. Cloud computing offers rented services on a pay-as-you-use basis which lead to adjusting the level of usage according to the current needs of the organization (37). Thus, it reduces the total cost of IT operations radically (12). The bigger the size and scope of the organization, the greater the demand for IT investment. Consequently, that firm size is a significant influence to cost investments in new information technology implementation. Cloud computing is an advanced technology that reduces both IT costs and removes many of the time limitations for large number user in the organization.

The first stage of the scale development and validation process will involve with defining the conceptual domain of the construct. In this stage, the researcher should specify and understand the nature of the construct that is consistent and clear with the prior research. The issues addressed to ensure the success of a CC-L implementation gathered through the literature review and have been grouped under organization support heading. There are five factors to consider before the construct conceptualization was written. The factors include understand and examine how the focal construct has been used in prior research, specify the nature of the construct conceptual domain, specify the conceptual theme of the construct and define the construct in unambiguous terms. Refer table 1.

4.2. Assess the Content Validity of the Items

The validity of the item was checked after the item generation, The researcher uses face validity by doing a simple audit checking by expert and interview with some academician in HEIs. The content validity has been ensured by a panel of experts and knowledgeable colleagues. They were asked about the benefits to achieve cloud computing implementation success in their company. Three of them agree with the question and able to answer all question accordingly. Thus, the question will consider validating and the researcher will proceed to the next step. Content analysis was further enhanced with the availability of the iterative process in the Delphi technique, where the R2 questionnaire was further enhanced based on reviews obtained from expert respondents in R1. Exam build for reliability is achieved by calculating Cronbach's alpha with 20 respondents experts. All construction was found to have sufficient alpha value by> 0.74 which showed better consistency.

4.3. The Measurement Model of Scale Development

For the identified variable of literature in Table 1, the questionnaire comprises two parts: user profiles and implementation variables. The item was formed on a seven-point Likert scale. Two rounds of pre-test were conducted to ensure that respondents were able to understand the things used in this study: first, the questionnaire was reviewed by the academician experienced in the design of the questionnaire. Subsequently, the questionnaire was tested with a known IT specialist. Step 3 in Table 4 produces a reliable and valid scale. The following sections cover each of the scale

development steps in the Delphi technique. Formally determine the measurement model. The next step is to formally determine the measurement model. A qualitative explanation cannot be measured unless we put the numbers in each of the given descriptions. Numbers with meaning will be numbers and allow for mathematical and statistical techniques for descriptive, explanatory and predictive purposes.

In this study, the researcher will use ordinal scale measurement because of all question related to a respondent opinion either Least Important to Most Important. 7 point Likert scale was chosen because it is more likely to reflect a respondent's true subjective evaluation of a usability questionnaire item than a 7-point item scale (38).

Table 4: The scale was ranking from 1-7

1	**Least Important**
2	Less Important
3	Slightly Important
4	Moderate Important
5	Important
6	Very Important
7	Most Important

4.4. Experts Selection

Moreover, input on the survey was collected from the be IT professional of the companies in the process of implementation. In this way, inspecting is aiming for information collection where respondents are drawn nearer by means of email and/or phone to discover out whether they are mindful of cloud computing and in the case so, whether they are prepared to implement cloud computing or they are within the handle of usage. If so, the appropriate time is decided by an appointment for Delphi's first-round data collection.

The size of the completed project will determine the number of expert panels the Delphi Method needs, but each panel should consist of about 10 to 20 members. The final panel size is determined by the requirements and estimates of those who govern the process. A random sampling of respondents is insufficient to form this panel (39). The criteria that qualify a person as a panel "expert" are determined by those who administer the process. The selection criteria for member validation are shown in *Table 5*

Table 5: Selection criteria for expert validation

Category of expert	**Criteria**	**References**
Practitioner (Management level)	Vast experience in managing CC-L implementation	(18,31,40–43,11)
Academic (Specific to CC-L research)	Vast experience in research and consultation with education	(18,31,40,42,43)
Service provider	Vast experience in managing to provide and consulting cloud computing services.	(11)

Commonly, in the first round, participants are required to give an opinion and rate their level of agreement with each statement using a Likert scale.

5. Conclusion

This paper discussed the development of scale measurement and validity selection for organizational support in Cloud Computing activities towards implementation success in the flow process of the Delphi technique. It is believed that the framework might be useful for further study on Cloud Computing implementation success in Malaysia.

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