Cloud Adoption Readiness Assessment Framework for Small and Medium Enterprises in Developing Economies

Evidential Reasoning Approach

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Abstract: The aim of this paper is to develop Cloud computing (CC) adoption readiness assessment framework for small and medium enterprises (SMEs) in developing economies. The benefits obtained from CC let the SMEs in developing economies to consider CC as an alternate technological solution. These SMEs require adoption readiness assessment framework in order to eliminate complexities during adoption. Most of the existing frameworks involve technological characteristics to assess adoption readiness and also do not handle uncertainties of decision makers. But, technological characteristics are not foremost indicates of adoption readiness. Therefore, this study proposes Cloud adoption readiness assessment framework based on organizational resources perspective using evidential reasoning (ER) approach. The finding of this study contributes to the existing CC literature and helps the practitioner to make an informed adoption decision. Lastly, the effectiveness of proposed framework is shown using case study.

1 INTRODUCTION

Cloud computing (CC) is a model which provides computing resources as a utility over the Internet. This technology shifts the trend of owning computing resources as a product to getting as a service.

The benefits obtained from CC (Armbrust et al., 2009; Schubert et al., 2010; Zhang et al., 2010; Espadanal and Oliveira, 2012) and the paradigm shift let the small and medium enterprises (SMEs) to adopt CC as an alternate technological solution. Cloud computing is an ideal technological solution for such SMEs with limited capital and human resource (Surendro and Fardani, 2012).

The potential benefits obtained from adopting CC outweigh the risks for SMEs (Low et al., 2011; Madisha and Van Belle, 2011). But SMEs in developing countries are lagging behind to adopt this technology (Amponsah et al., 2016; Yeboah-Boateng and Essandoh, 2014). This is because of the obstacle they might face like uncoordinated adoption and lack of inadequate business and technical insight (Garrison et al., 2012). To coordinate adoption process they must perform internal Cloud readiness assessment before adoption (El-Gazzar, 2014). If an organization is not attained the desired level of readiness before adoption, the adoption of CC result into failure (Akande and Belle, 2014). Therefore, it is necessary to measure the degree of readiness of the organization in advance (Surya and Surendro, 2014).

Since resources are a key driver and barrier of technology adoption in developing countries (Molla and Licker, 2005), it is important to consider the adoption readiness and likelihood of adoption success of an organization from a resources perspective. But, there is a paucity of organizational capabilities based Cloud adoption readiness assessment models which guide SMEs. Also very little is known about IT capabilities needed to determine adoption readiness and successful deployment of CC in SMEs (Carroll et al., 2014; Rockmann et al., 2014). Therefore, for SMEs to adopt and benefit from CC they need clear resource-based assessment model (Loebbecke et al., 2012).

Most of the existing Cloud adoption readiness assessment models are based on technological characteristics like ease-of-use, perceived usefulness and so on (Akande and Belle, 2014; Carcary et al.,

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2014; Idris et al., 2014; Kauffman et al., 2014). Technological characteristics are not real indicators of preparedness of an organization in the least developing nations (Workineh et al., 2017). The foremost indicators of adoption of innovation are organizational capabilities (Azadegan and Teich, 2010; Iacovou et al., 1995).

The existing studies also do not handle decision makers (DMs) uncertainty. Evidential reasoning approach appears to be appropriate multi-criteria decision-making approach for handling DMs uncertainty (XU, 2012). That's why this study proposed Cloud adoption readiness assessment framework based on ER approach.

This paper is organized as follows: in section 2, related work is reviewed. A basic concept of evidential reasoning approach is presented in section 3. The ER approach for Cloud adoption readiness evaluation is elaborated in section 4. Section 5 shows the case study. Section 6 discusses managerial and theoretical implication and forward future research directions. The last section gives concluding remarks.

2 RELATED WORK

The trend for the adoption of CC is increasing significantly from time to time and gained enormous interest in research (Loebbecke et al., 2012). As a result of this several empirical studies proposed in the literature to assess adoption readiness of an organization (Akande and Belle, 2014; Carcary et al., 2014; Kauffman et al., 2014; Surya and Surendro, 2014). These studies assess qualitatively Cloud adoption readiness of an organization taking technological characteristics into consideration.

There are very few exceptional studies which assess Cloud adoption readiness quantitatively only from organizational capabilities perspective (Surendro and Fardani, 2012; Workineh et al., 2017). But these studies do not show the extent of readiness of an organization quantitatively.

Loebbecke et al. (2012) proposed a method for assessing the cloud readiness of an organization's. The method relies purely upon yes/no criteria and the decision maker's judgment. This results in subjectivity and uncertainty of the DMs.

The above studies do not handle DM uncertainty and also do not assess cloud adoption readiness quantitatively from organizational capabilities perspective only. Hence, Multi-criteria decision making method which is considered as a better approach to avoid biases of the DM is required to assess adoption readiness of CC from organizational resources perspective. This study is in a position to explore the applicability of such an approach in the context of Cloud readiness assessment.

3 CONCEPT OF ER APPROACH

The ER approach employs belief structures to elicit a decision maker's preferences and to handle uncertainties involved during measurement (XU, 2012). The belief degree refers to the degree of confidence that assessed object has anticipated measurement grade on a particular criterion.

Suppose A is an object to be assessed, with L criteria C= {C_1, C_2, …, C_l, ..., C_L} and N evaluation grade H = { H_1, H_2, H_3, Hn,..., H_N}, with the weights of criteria are given as ω = {ω_1 ω_2 ,...,ω_l ,...,ω_L} where $\omega_l > 0$ and ω_l is normalized weight.

The assessments of the K alternatives on the L criteria can be represented using belief decision matrix (Table 1) with $S(C_i(A_K))$ as its element at the k^{th} row and i^{th} column, where $S(C_i(A_K))$ is given as :

$$S(C_i(A_k))=\{(H_n, \beta_{n,i}(A_k)), n=1, 2,\ldots, N, i=1,2,\ldots, L, k=1,2,\ldots, K\}. \quad (1)$$

Where

$$0 \leq \beta_{n,i}(A_k) \leq 1 \text{ and } \sum_{n=1}^{N} \beta_{n,i}(A_K) \leq 1$$

$\beta_{n,i}(A_k)$ denote the belief degree of alternative A_k when assessed to grade Hn for n=1, 2,…, N on criterion C_i,

Table 1: belief decision matrix.

	C_1	C_2	…	C_L
A_1	$S(C_1(A_1))$		…	$S(C_l(A_1))$
A_2				
…				
A_k	$S(C_1(A_k))$		…	$S(C_L(A_k))$

The belief degree unassigned to any specific evaluation grade (β_H), can be represented as:

$$\beta_H = 1 - \sum_{n=1}^{N} \beta_{n,i} \quad (2)$$

4 ER APPROACH APPLICATION

The ER approach consists of five major steps (Xu and Yang, 2005). In this section, these ER steps to assess Cloud adoption readiness of an organization were illustrated.

4.1 Hierarchical Assessment Model and Index Identification

The criteria identified from literature (Workineh et al., 2017) are structured hierarchically in figure 1. The relative weight of these criteria and sub-criteria is computed using Analytic Hierarchy Process (AHP) method (Saaty, 1990) and given in table 4. Five evaluation grades were set by decision maker to assess each qualitative criterion as shown in table 2.

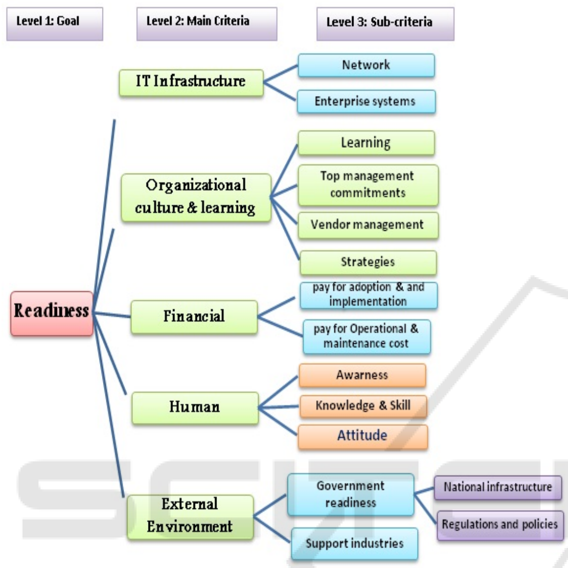

Figure 1: Cloud adoption readiness Evaluation criteria.

Table 2: Linguistic variables and Evaluation grade value.

Evaluation Grade		H1	H2	H3	H4	H5
Linguistic variable		NR	SR	R	MR	CR
evaluation grade value	%	< 60	60-70	70 -80	80-90	90-100
	average	30	65	75	85	95

Where NR=Not ready, SR=Slightly Ready, R=ready, MR=more likely ready, CR=certainly ready

4.2 Apply Information Transformation

For ER algorithm to aggregate evaluation index, all lower level criteria need to be transformed to associated upper level criteria measurement grade. To get an aggregated evaluation index for the decision criterion first, the evaluation result on these main criteria need to be transformed to decision criterion measurement grades based on a rule or utility function depending on decision maker's preferences. A rule-based transformation is usually used to transform verbal grades to a different number of verbal grades.

The quantitative criterion also needs to be combined with other qualitative criteria in the same level so that a single aggregated evaluation index generated for the decision criterion. For instance, the operational expenditure of an organization needs to be transformed into five verbal measurement grades of decision criteria. To transform, a range of values of criteria need to be defined by expert as shown in table 3. The transformation process needs to be done without any data loss (Yang, 2001).

Table 3: Transformation of Lowest Level Criteria Assessments to Upper Levels.

Sub-criteria/ assessment grades	NR	SR	R	MR	CR
Operational expenditure in million	1	2	3	4	5
implementation expenditure in million	2	4	6	8	10

Let h_{n+1} and h_n be the values of upper and lower evaluation grade respectively, then the distributed degree of belief for certain quantitative input data (h) (where $h_n \leq h \leq h_{n+1}$) with respect of upper and lower evaluation grade is given as:

$$\beta_{n,i} = \frac{h_{n+1} - h}{h_{n+1} - h_n}\ ;\ \beta_{n+1} = 1 - \beta_n \qquad (3)$$

Where β_{n+1} and β_n are the degree of belief associated with respect to upper and lower level evaluation grade respectively.

4.3 Compute Basic Probability Mass

Decision makers directly assess a given alternative against each lower level criterion and assign belief degrees to each assessment grade to measure the performance in table 4. Then basic probability mass $m_{n,i}$, which represents the degree to which the i^{th} criterion is assessed to the n^{th} evaluation grade Hn, of each lower level criterion computed as:

$$m_{n,i} = m_i(H_n) = \omega_i \beta_{n,i} \quad \text{n=1, 2 … N} \qquad (4)$$

Let $m_{H,i}$ be a remaining basic probability mass unassigned to any individual grade for i^{th} criterion. Then $m_{H,i}$ can be computed as (Xu et al., 2006; Xu and Yang, 2005; Yang and Xu, 2002a, 2002b; Yang, 2001):

$$m_{H,i} = m_i(H) = 1 - \sum_{n=1}^{N} m_{n,i} = 1 - \omega_i \sum_{n=1}^{N} \beta_{n,i} \qquad (5)$$

The unassigned basic probability mass may be caused due to: weights of the i[th] criterion $\overline{m}_{H,i}$ or incompleteness of evaluation on i[th] criterion $\widetilde{m}_{H,i}$.

$$m_{H,i} = \overline{m}_{H,i} + \widetilde{m}_{H,i} \quad (6)$$

Where:

$$\overline{m}_{H,i} = 1 - \omega_i \text{ and } \widetilde{m}_{H,i} = \omega_i (1 - \sum_{n=1}^{N} \beta_{n,i})$$

For instance, government readiness has two sub-criteria national infrastructure and regulation and policy. Hence before computing probability mass of government readiness first, the probability mass of the two sub-criteria has to be computed.

Based on the belief degree assigned for national infrastructure in table 4 ($\beta_{1,1}$=0, $\beta_{2,1}$=0.7, $\beta_{3,1}$=0.3, $\beta_{4,1}$=0, $\beta_{5,1}$=0) and the relative importance of criterion (ω_1=0.667), the probability mass computed using equation 4 as: $m_{1,1} = \omega_1 \beta_{1,1} = 0$, $m_{2,1}$ = 0.4669, $m_{3,1}$=0.2001, $m_{4,1}$= 0, and $m_{5,1}$=0. The unassigned probability mass is $m_{H,1}$= 0.33 where $\overline{m}_{H,i} = 1 - \omega_i$ =1-0.667=0.33 and $\widetilde{m}_{H,1}$=0.

Similarly, the probability mass for Regulation and policy criterion need to be computed to aggregate together.

4.4 Aggregating Assessment

The ER algorithm aggregating multiple criteria based on belief decision matrix and the evidence combination rule of the Dempster-Shafer theory (Taroun and Yang, 2011; Yang and Xu, 2002a). Each row of the decision matrix represents basic probability mass related to a lower level criterion. For instance, the basic probability mass assigned to evaluation grade and remaining probability mass unassigned to any individual grades for sub- criteria of government readiness gives decision matrix (M1).

$$M1 = \begin{bmatrix} m_{1,i} & m_{2,i} & m_{3,i} & m_{4,i} & m_{5,i} & m_{Hi} \\ 0 & 0.47 & 0.20 & 0 & 0 & 0.33 \\ 0.20 & 0.13 & 0 & 0 & 0 & 0.67 \end{bmatrix}$$

Let $m_{n,I(1)} = m_{n,1}$ for n=1, 2,...,N, $\overline{m}_{H,I(1)} = \overline{m}_{H,1}$, $\widetilde{m}_{H,I(1)} = \widetilde{m}_{H,1}$, then the combined probability mass of government readiness based on the values of the two sub-criteria computed as follow:

$$m_{1,I(2)} = K_{I(2)}(m_{1,1}m_{1,2} + m_{H,1}m_{1,2} + m_{H,2}m_{1,1}) \quad (7)$$

$$= K_{I(2)}(0x0.20 + 0.33x0.20 + 0.67x0)$$

$$= K_{I(2)}(0.066)$$

Where $K_{I(2)}$ normalization factor which is used to resolve the conflict and can be calculated as:

$$k_{I(2)} = \left[1 - \sum_{n=1}^{5} \sum_{t=1, t\neq n}^{5} m_{n,I(1)} m_{t,2}\right]^{-1} = 1.19 \quad (8)$$

Hence for government readiness,

$$m_{1,I(2)} = k_{I(2)}(0.66) = 1.19x).066 = 0.0785 .$$

Similarly the remaining degree of belief can be calculated as: $m_{2,I(2)}$ = 0.498, $m_{3,I(2)}$ = 0.134, $m_{4,I(2)}$ =0, and $m_{5,I(2)}$ =0

The unassigned belief degree due to the weights of the criterion can be calculated as:

$$\overline{m}_{H,I(2)} = K_{I(2)}(\overline{m}_{H,1}\overline{m}_{H,2}) \quad (9)$$

$$\overline{m}_{H,I(2)} = 1.19x0.33x0.67 = 0.263$$

The unassigned belief degree due to incompleteness of evaluation can be calculated as:

$$\widetilde{m}_{H,I(2)} = k_{I(2)}\left[\widetilde{m}_{H,1}\widetilde{m}_{H,2} + \overline{m}_{H,1}\widetilde{m}_{H,2} + \widetilde{m}_{H,1}\overline{m}_{H,2}\right] \quad (10)$$

Then the remaining belief degree that is not assigned to any individual grade {H} can be calculated as using equation 6 as:

$$m_{H,i} = \overline{m}_{H,i} + \widetilde{m}_{H,i} = 0.263 + 0 = 0.263$$

From the final combined basic probability mass the combined degree of belief for a criterion calculated as (Yang, 2001; Yang and Xu, 2002a; Xu and Yang, 2005; Taroun and Yang, 2011):

$$\text{H}_n\text{: } \beta_n = \frac{m_{n,I(2)}}{1 - \overline{m}_{H,I(2)}} \text{ n=1,2,..., N} \quad (11a)$$

$$\beta_H = \frac{\widetilde{m}_{H,I(2)}}{1-\overline{m}_{H,I(2)}} \quad (11b)$$

The distributed belief degree for government readiness using eq. 11a obtained as: β_1=0.1065, β_2=0.6757, β_3= 0.1818, β_4=0 and β_5=0.

Then the final distributed assessment for government readiness criteria can be represented as: S(A)={(NR, 10.65%), (SR, 67.57%), (R, 18.18%), (MR, 0), (CR, 0)}

Let's say the high level criterion has L sub-criteria which is assessed with five evaluation grade H= {H_1, H_2, H_3, H_4, H_5}. Then the assessment of an object on this criterion lead to an assessment matrix M(2) taking basic probability mass $m_{n,i}$ assigned to evaluation grade and remaining probability mass unassigned ($m_{H,i}$) to any grades. To find aggregated single distributed belief degree, each row of the matrix need to be aggregated recursively.

$$M2 = \begin{bmatrix} m_{1,1} & m_{2,1} & m_{3,1} & m_{4,1} & m_{5,1} & m_{H,1} \\ m_{1,2} & m_{2,2} & m_{3,2} & m_{4,2} & m_{5,2} & m_{H,2} \\ \ldots & \ldots & \ldots & \ldots & \ldots & \ldots \\ m_{1,L} & m_{2,L} & m_{3,L} & m_{4,L} & m_{5,L} & m_{H,L} \end{bmatrix}$$

The aggregation carried out first by aggregating the first row with the second row. Then this result will be aggregated with the third row. This aggregation continues iteratively until all rows of the matrix are combined in this fashion.

The more generalized version of combined probability represented using the following equation:

$$m_{n,I(i+1)} = k_{I(i+1)} \begin{bmatrix} m_{n,I(i)} m_{n,i+1} + m_{n,I(i)} m_{H,i+1} + \\ m_{H,I(i)} m_{n,i+1} \end{bmatrix} \quad (12)$$

Where

$$k_{I(i+1)} = \left[1 - \sum_{n=1}^{N} \sum_{t=1, t\neq n}^{N} m_{n,I(i)} m_{t,i+1} \right]^{-1} \quad (13)$$

for i={1, 2,..., L-1}

The unassigned degree of belief can be also computed as:

$$\{H\}: \; m_{H,I(i)} = \overline{m}_{H,I(i)} + \widetilde{m}_{H,I(i)} \quad (14)$$

Where

$$\overline{m}_{H,I(i+1)} = K_{I(i+1)} (\overline{m}_{H,I(i)} \overline{m}_{H,i+1}) \quad (15)$$

$$\widetilde{m}_{H,I(i+1)} = k_{I(i+1)} \begin{bmatrix} \widetilde{m}_{H,I(i)} \widetilde{m}_{H,i+1} + \\ \overline{m}_{H,I(i)} \widetilde{m}_{H,i+1} + \widetilde{m}_{H,I(i)} \overline{m}_{H,i+1} \end{bmatrix} \quad (16)$$

From the final combined basic probability mass the combined degree of belief calculated as follow:

$$\{H_n\}: \; \beta_n = \frac{m_{n,I(L)}}{1-\overline{m}_{H,I(L)}} \quad n=1,2,..., N \quad (17a)$$

$$\beta_H = \frac{\widetilde{m}_{H,I(L)}}{1-\overline{m}_{H,I(L)}} \quad (17b)$$

4.5 Apply Utility Function

After obtaining aggregated distributed belief structure, ranking or sorting alternatives based on their performance may be required. But the distributed belief degree is not suitable for such a purpose. Hence, to precisely evaluate the objects expected utilities of individual evaluation grades, denoted by U(H_n), need to be estimated first. Utilities to each grade can be assigned as evenly distributed among evaluation grade or taking the preference of DMs to a certain evaluation grade, the utility function assigns a number to an evaluation grade. For an alternative A, suppose the utility of an evaluation grade Hn is U(Hn), then the expected utility of the aggregated assessment is defined :

$$U(S(A)) = \sum_{n=1}^{N} \beta_n(A) U(H_n) \quad (18)$$

Note that βn denotes the lower bound of the likelihood that the alternative A is assessed to Hn. The upper bound of the likelihood is given by (βn +β_H) (Yang, 2001; Yang and Xu, 2002a, 2002b).

If the assessment is imprecise, a utility interval can be established for distribution assessment based on where the unassigned degree of belief goes either to the least preferred grade or goes to the most preferred grade (Yang, 2001). Suppose the highest preferred grade having the highest utility is $\mathbf{H_{n+1}}$ and the least preferred grade having the lowest utility is $\mathbf{H_n}$. Then the maximum, minimum, and average expected utility of alternative A is given by:

$$U_{\max}(A) = \sum_{n=1}^{N-1} \beta_n(A)U(H_n) + (\beta_n(A) + \beta_H(A))U(H_n) \quad (19)$$

$$U_{\min}(A) = (\beta_1(A) + \beta_H(A))U(H_1) + \sum_{n=2}^{N} \beta_n(A)U(H_n) \quad (20)$$

$$U_{avg}(A) = \frac{U_{\max}(A) + U_{\min}(A)}{2} \quad (21)$$

If all the original assessments S(A) in the belief decision matrix are complete, then $\beta_H(A)=0$ and the evaluation value of an object A is a point value. Otherwise, the value of an object A is an interval.

5 CASE STUDY

In this section, the result from using the ER framework to assess Cloud readiness of a public University in Ethiopia, namely Ambo University, is considered. Ambo University delivers its services in four campuses. Currently, it is strengthening ICT office to improve its service delivery for academician, students and other stakeholders. All campuses have dedicated broadband Internet connection and mini data centre. According to the ICT director the university has an interest to adopt public Cloud services for some of the services rendering to stakeholders to gain cost reduction and bring agility to services' it provides. Hence, it is required to assess its extent of preparedness in advance for successful adoption. The extent of preparedness of the university computed and expert opinion on the result was obtained.

To evaluate the adoption readiness of Ambo University first, the DMs evaluate the University against the basic criteria as shown in table 4. Then distributed degrees of belief of assessments given by the DMs are fed into a demonstration version of intelligent decision support system (IDS), implementing ER approaches (Xu et al., 2006; Xu and Yang, 2005) and then aggregated results for decision criteria are obtained as shown in figure 2.

A quantified form of overall distributed assessment is given as expected utility. The expected utility is computed based on belief degree of evaluation grade and based on the evenly distributed utility among evaluation grades (($U(H_1)=0$, $U(H_2)=25$, $U(H_3)=50$, $U(H_4)=75$, $U(H_5)=1$)). Hence, the expected utility of the assessment or the degree of readiness of the University is computed as 0.3422. Since the utility for lower level assessment grade is zero the minimum and expected utilities are equal.

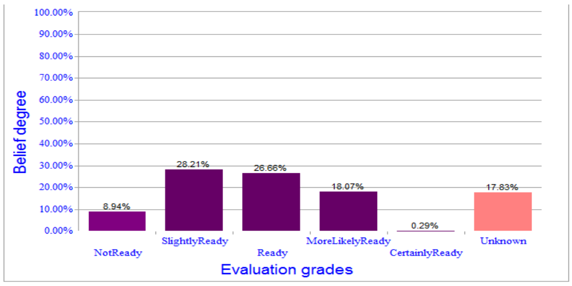

Figure 2: Distributed assessment of Cloud adoption readiness for Ambo University.

The extent of readiness of the University in the second level criteria is clearly shown in figure 3. Based on the assessment given by DMs the minimum, an average and maximum utility for decision variable obtained from IDS as minimum utility: 0.3422, maximum utility: 0.5206, and average utility: 0.4314. The interval between minimum and maximum utility can capture the extent of adoption readiness of an organization. The experts in the ICT office of the University also agree with the validity of the result obtained.

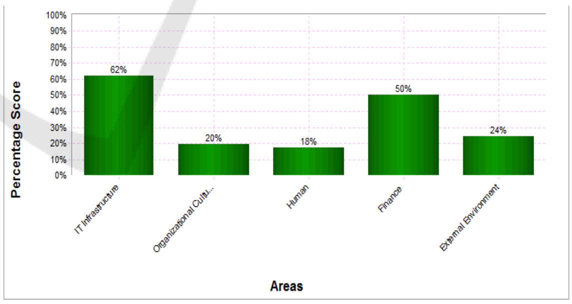

Figure 3: Extent of readiness on main criteria.

6 DISCUSSION

Cloud adoption decision is a strategic decision in which the decision made at the early time might affect the organization at the later time. For adoption decisions to go well at the later time the adoption readiness must be assessed in advance. A detailed understanding of Cloud readiness enables an organization to adopt cloud solutions successfully.

In order to ensure adoption readiness, SMEs in developing nations must assess its readiness from an organizational capabilities perspective.

The framework proposed in this study assesses adoption readiness quantitatively from organization resources perspective and can handle uncertainty in DMs. It can also evaluate the extent of readiness of an organization more precisely and helps the DMs to make an informed decision before adoption.

6.1 Theoretical and Managerial Implications

This study can extend the boundary of the Cloud computing literature by (1) establishing Cloud adoption readiness assessment framework based on ER approaches, and (2) Identify organizational capability based hierarchically assessment model and the relative importance of each criterion. The framework can also serve as a Practical guideline to carry out cloud adoption readiness assessments and to make an informed adoption decision.

6.2 Limitations and Future Work

The criteria for hierarchically assessment model were identified only from literature. For exhaustiveness of the criteria experts from the industry have to be interviewed. The intention of measuring adoption readiness is to avoid adoption failure or to predict the likelihood of adoption success. So, in the next step hierarchically assessment model needs to be enhanced in order to predict the likelihood of Cloud adoption success of an organization.

7 CONCLUSIONS

For an organization to adopt successfully latest technology like CC managers need to consider adoption readiness of an organization in advance. Adoption readiness assessment is a key step in feasibility analysis of technology adoption. When decision-maker is evaluating adoption readiness against a pre-determined set of criteria, he/she may face some uncertainty due to lack of decision data and incomplete information. But none of the methods proposed in the literature able to address the issue of uncertainty. Hence, a framework which can handle such kind of problems and helps DMs to make an informed decision is needed. This study proposed Cloud adoption readiness assessment framework based on ER approach to fill this gap. The proposed framework helps DMs in identifying the extent of readiness of an organization in each criterion and in addressing areas that need to be improved before adoption more precisely. As result organization can avoid unsuccessful adoption. Unlike others readiness assessment framework, which judging an organization simply as ready or not ready, the one proposed in this research clearly shows the extent of readiness of an organization in each criterion quantitatively. Therefore, it is found out as an appropriate methodology for the decision makers to make an informed decision.

Table 4: The index system of Cloud Adoption readiness.

Top layer	Dimension	Weight	Cloud capabilities/ Factors	Weight	Belief Degree AU
Readiness	IT-Infrastructure	30.7 %	network technologies	88.9%	{(H3 , 0.5), (H4 , 0.5)}
			enterprise systems	11.1%	{(H2 , 0.3), (H3 , 0.5)}
	organizational culture and strategy	8.8%	learning capabilities	20%	{(H4 , 0.6), (H5 , 0.4)}
			Top management commitments	67%	{(H1 , 0.6), (H2 , 0.4)}
			vendor management	4.1%	{(H3 , 1)}
			strategies	8.7%	{(H2 , 0.5), (H3 , 0.5)}
	Human	4.3%	Awareness about CC	13.7%	{(H2 , 0.5), (H3 , 0.4)}
			Knowledge and skill	62.5%	{(H1 , 0.6), (H2 , 0.4)}
			Attitude	23.8%	{(H2 , 0.25), (H3, 0.75)}
	Finance /Economic	23.4%	payment for adopting	50%	5000000
			payment for operational	50%	3000000
	External Environment	32.7%	Government readiness	80.0%	
			• National infrastructure	66.7%	{(H2 , 0.7), (H3 , 0.3)}
			• Regulation & Policy	33.3%	{(H1, 0.6), (H2 , 0.4)}
			support industries	20.0%	{(H4 , 0.8)}

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