



**Factors hindering acceptance of using cloud services in university: A case study**

Journal:	<i>The Electronic Library</i>
Manuscript ID:	EL-May-2011-0074
Manuscript Type:	Article
Keywords:	Academic libraries, University libraries, End-user computing, Information centres, Information technology strategy

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## Factors hindering acceptance of using cloud services in university: A case study

### Abstract

**Purpose** - This paper proposed a novel evaluation framework to explore the “root causes” that hinder the acceptance of using internal cloud services in a university.

**Design/methodology/approach** - The proposed evaluation framework incorporates the duo-theme DEMATEL (Decision Making Trial and Evaluation Laboratory) with the TAM (Technology Acceptance Model). The operational procedures were proposed and tested on a university during the post-implementation phase after introducing the internal cloud services.

**Findings** - According to the results, clear understanding and operational ease under the theme Perceived Ease of Use (PEOU) are more imperative; whereas improved usefulness and productivity under the theme Perceived Usefulness (PU) are more urgent to foster the usage of internal clouds in the case university.

**Research limitations/implications** - Based on the findings, some intervention activities were suggested to enhance the level of users’ acceptance of internal cloud solutions in the case university. However, the results should not be generalized to apply to other educational establishments.

**Practical implications** - To reduce the resistance from using internal clouds, some necessary intervention activities such as developing attractive training programs, creating interesting workshops, and rewriting user friendly manual or handbook are recommended.

**Originality/value** – The novel two-theme DEMATEL has greatly contributed to the conventional one-theme DEMATEL theory. The proposed two-theme DEMATEL procedures were the first attempt to evaluate the acceptance of using internal clouds in university. The results have provided manifest root-causes under two distinct themes, which help derive effectual intervention activities to foster the acceptance of usage of internal clouds in a university.

**Keywords** Cloud computing, cloud services, two-theme DEMATEL, university.

**Paper type** Case study

## 1. Introduction

Cloud computing, an innovative technology with dynamic scalability and usage of virtualized resources as a service through the Internet, is regarded as potential solutions to advancing modern organizations' IT competitiveness and performance (Catteddu and Hogben, 2009; Ercan, 2010; Goscinski and Brock, 2010; Wu, 2011; Thomas, 2011). Depending on its architecture, cloud computing can be categorized into three types: (1) external/public clouds—resources dynamically provided on a self-service basis over the Internet via web services from an off-site third-party provider; (2) internal/private clouds—data and processes managed within an organization without the restriction of network bandwidth or security exposures; and (3) hybrid clouds—the environment consisting of multiple internal and external cloud computing solutions (Rimalet al., 2009). External clouds are carried out on the hardware that organizations do not need to own or operate—the users send their input data to the clouds offered by the service providers, after processed, the results are then sent back to the users (Mowbray and Pearson, 2009). Because the external clouds are not fully compatible with the IT infrastructure that an organization may have, they are unable to act as seamless extension to internal resources. In contrast, internal clouds have advantages of compatibility with legacy applications, higher efficiency of existing resources, and less risk by keeping computing within the firewall, they are more attractive to organizations (Yachin, 2008). The organizations do worry about the issues related to data security, reliability, speed, and inevitable legacy when introducing the cloud computing (Thomas, 2011). Therefore, many of them may incline to introduce the internal clouds instead of the external clouds. Apart from these advantages, some problems may still exist even if an organization introduces the internal cloud solutions. Basically, the problems are present at the pre-implementation phase (e.g., initiation, adoption, and adaptation) and/or post-implementation phase (e.g., acceptance, routinization, and infusion)—the problems at the former phase are associated with the organizational decisions to introduce a new technology, while the problems at the later phase are related to efforts undertaken to induce the organizational members to commit to use the new technology (Venkatesh and Bala, 2008).

As of today, use of cloud services is not as popular as anticipated in most universities in Taiwan despite that cloud computing has been thought useful in advancing the academic research, pedagogical materials and administrative tasks (Sultan, 2010). Recently, a Japanese cloud vendor, attempting to enter into Taiwan's cloud business market, has offered the case study university with internal cloud solutions free of charge as a pilot marketing experiment. The offered internal clouds can implement a completely virtualized environment for its servers, desktops, and applications so as to improve the university's IT server efficiency, and more importantly, to halt the procurement of new high-powered PCs that would otherwise end up with vast underutilization. The adoption of this new technology was regarded as a promising way to enhance the university's IT competitiveness and performance. However, it seemed that the progress during the post-implementation phase was not as favorable as expected. The main objectives of this study, therefore, are to conduct assessment to unveil the "root causes" hindering the "acceptance" of using internal cloud solutions and, furthermore, to propose intervention activities to overcome the hindrances. To this end, a novel evaluation framework, which incorporates the duo-theme DEMATEL (Decision Making Trial and Evaluation Laboratory) with the TAM (Technology Acceptance Model), is proposed. The rationales for the duo-theme DEMATEL include (1) exploring the causal knowledge in two themes—Perceived

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3 Ease of Use (PEOU) and Perceived Usefulness (PU), and (2) creating a manifest  
4 integrated causal map, from which the decision makers can clearly visualize the “root  
5 causes” so as to develop effective intervention activities.  
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7 The rest of this paper is organized as follows. In section 2, the proposed evaluation  
8 framework with its relevant methodologies is elaborated. In section 3, implementation  
9 of the proposed evaluation framework to the case university is demonstrated. In  
10 section 4, some implications are discussed based on the results. Finally, conclusions,  
11 limitations and suggestions for future studies are addressed.  
12

## 13 **2. Methodology**

### 14 *2.1 The themes of accepting new technologies*

15 Coined by Davis (1986), the Technology Acceptance Model (TAM) was proven  
16 useful and has become popular for investigating an issue on the user “acceptance” of  
17 implementing new technologies. To date, various advanced forms of TAM have been  
18 proposed, for instance, the first modified version (Davis et al., 1989), the final  
19 modified version (Venkatesh and Davis, 1996), TAM2 (Venkatesh and Davis, 2000),  
20 the Unified Theory of Acceptance and Use of Technology (UTAUT) model  
21 (Venkatesh et al., 2003), and TAM3 (Venkatesh and Bala, 2008).  
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23 Referring to King and He (2006), there are four kinds of modifications contributed  
24 to the evolution of TAM, including altering external antecedents, amending predictive  
25 variables, manipulating moderator variables, and varying consequence measures. The  
26 built-in core parts commonly to all modifications of TAM, however, consist of three  
27 constructs: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), and  
28 Behavioral Intention (BI). Of them, BI is affected by both PU and PEOU, and PU is  
29 further influenced by PEOU. Venkatesh and Bala (2008) also indicated that PEOU  
30 and PU are the two influential and imperative constructs within the TAM; hence, if  
31 organizations wish to make more informative decisions for greater acceptance and  
32 effective utilization of new technologies, both PEOU and PU must be emphasized  
33 while designing the effectual interventions to improve the degree of acceptance. In  
34 fact, a number of studies have also viewed both PEOU and PU as two core constructs  
35 that would shape users’ attitudes and intentions in “accepting” new technology  
36 systems (e.g., Ngai et al., 2007; Chatzoglou et al., 2009; Lee et al., 2010; Terzis and  
37 Economides, 2011).  
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39 Specifically, a considerable amount of literature has employed TAM-related  
40 approach to identifying the relationships between the determinants and behavioral  
41 intention in various fields. For example, Huang et al. (2007) employed the TAM to  
42 examine the acceptance of mobile learning. Ngai et al. (2007) examined the adoption  
43 of Web Course Tools and indicated that technical support has a significant direct  
44 effect on PEOU and PU, while PEOU and PU are the dominant factors affecting the  
45 attitude of students using the Web Course Tools. Liaw (2008) investigated students’  
46 perceived satisfaction, behavioral intention, and effectiveness of e-learning. van Raaij  
47 and Schepers (2008) examined the acceptance and use of a virtual learning  
48 environment in China. Chang and Chang (2009) employed the theory of planned  
49 behavior and the TAM to investigate the acceptance of library self-issue and return  
50 systems. Lin and Chou (2009) utilized constructs of TAM to assess the acceptance of  
51 citation database interfaces by university graduate students. Goh and Liew (2009)  
52 used the TAM as the base framework to investigate user acceptance of SMS-based  
53 library catalogue system. Teo (2009) explored technology acceptance in education.  
54 Lee et al. (2009) examined learners’ acceptance of e-learning in South Korea. Teo et  
55 al. (2009) assessed the intention to use technology among pre-service teachers in  
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Singapore and Malaysia. Chatzoglou et al. (2009) investigated Greek employees' intention to use web-based training and found that enjoyment, PU, and PEOU directly affect employees' intention to use web-based training, while learning goal orientation has the strongest indirect impact on employees' intention. Liu et al. (2010) explored the factors affecting the intention of using an Online Learning Community. Chen (2010) investigated the pre-service teachers' use of technology to support student-centered learning. Tzeng (2011) investigated the perceived values and prospective users' acceptance of new technology systems. Cheng et al. (2011) examined the acceptance of competency-based workplace e-learning systems. van Rooij (2011) investigated the adoption of open source software for teaching and learning and discussed the relationship between organizational culture and technology adoption. Terzis and Economides (2011) inspected the acceptance and use of computer based assessment (CBA) and indicated that PEOU has a direct effect, while PU has only an indirect effect, on CBA use. Lai and Chen (2011) explored factors influencing the secondary school teachers' adoption of teaching blogs.

Based upon the literature, this study deals with the "acceptance" of usage of internal clouds for the case university by two themes: PEOU and PU, which will be implemented in the procedures of the duo-theme DEMATEL (Decision Making Trial and Evaluation Laboratory), to be elaborated as follows.

## 2.2 *The duo-theme DEMATEL*

DEMATEL is a causal analysis technique for acquiring causal knowledge due to its capability of visualizing the structure of complicated causal relationships (Wu et al., 2011). Originated from the Geneva Research Centre of the Battelle Memorial Institute, the DEMATEL was designed to deal with important issues of world societies as a causal analysis technique for gaining causal knowledge (Gabus and Fontela, 1972, 1973). The conventional one-theme DEMATEL approach has been widely applied in various fields (e.g., Wu and Lee, 2007; Lin and Wu, 2008; Wu, 2008; Tseng, 2009; Tseng, 2010); however, it has some limitations—the foundational limitation is that it mixes all multifaceted constructs/factors into one theme, and thus produces incomplete cause-effect results which may mislead the decision-makings (Wu et al., 2011).

People tend to employ the one-theme DEMATEL approach to simplify the complex factors of a problem. In practice, however, some problems had better divide the complex factors into two distinct themes in order to undertake effective and profound analyses, respectively. For instance, while conducting a questionnaire survey with such questions as agree and disagree, satisfied and dissatisfied, yes and no, and among others, an in-depth understanding of the factors leading to favourable answers (agree, satisfied, yes, etc.) can be as important as an insightful exploration of the factors causing unfavourable responses (disagree, dissatisfied, no, etc.). It is good to scrutinize the reasons why people are for something; it is better if one could, in the meanwhile, also disclose the reasons why people are against something. In so doing, the problems would have become more exhaustively understood so that the decision makers can take favourable actions that would foster something on one hand, and avoid taking any negative doings that would deteriorate something on the other.

Specifically, the Motivation-Hygiene Theory emphasized that job "satisfaction and dissatisfaction" are two different and independent dimensions in that an increase in satisfaction may not lead to a decrease in dissatisfaction (Herzberg et al., 1967). The opposite of "satisfaction" is "no satisfaction" rather than "dissatisfaction" (DeShields et al., 2005). Likewise, the opposite of "dissatisfaction" is "no dissatisfaction" rather

than “satisfaction.” Another example of two-theme problem is the emotion study on product design, where Desmet (2002) treated 14 different types of emotion into two dimensions: pleasant emotion (e.g., desire, pleasant surprise, inspiration, amusement, admiration, satisfaction, and fascination) and unpleasant emotion (e.g., indignation, contempt, disgust, unpleasant surprise, dissatisfaction, disappointment, and boredom). Similarly, Laros and Steenkamp (2005) developed a hierarchy of consumer emotion that consists of two dimensions: positive emotion (e.g., contentment, happiness, love, and pride) and negative emotion (e.g., anger, fear, sadness, and shame). In dealing with the above two-theme problems, the conventional one-theme DEMATEL seems not appropriate.

Recently the pioneer duo-theme DEMATEL has been developed by Wu et al. (2011) to handle the “trust” issue of Software as a Service (SaaS)—one of the most popular types of cloud services. The authors treated the “trust” issue of SaaS in an organization with two distinct themes: perceived benefits (PB) and perceived risks (PR), with the underlying theory that if the potential users could perceive with higher PB and/or lower PR then the users would have higher trust on adopting the SaaS solutions. According to Wu et al. (2011), the two-theme DEMATEL evaluation framework for trust of SaaS adoption is depicted in Figure 1, and the resulted integrated causal map (PB-PR matrix)—a four-quadrant causal map—is displayed in Figure 2. The decision makers can visually detect the root causes in both themes from Figure 2 and further spotlight on the root causes to develop effective actions.

**Figure 1.** The evaluation framework for trust of SaaS adoption (Wu et al., 2011)

**Figure 2.** The four-quadrant causal map (Wu et al., 2011)

The rationales for the four-quadrant causal map are explained as follows. Let vector  $D$  and vector  $R$  denote the sum of rows and the sum of columns from the total-relation matrix, respectively. Then the horizontal axis ( $D+R$ ) reveals how much importance the factor has, and the vertical axis ( $D-R$ ) divides factors into cause group and effect group—the factor belongs to the cause group if ( $D-R$ ) is positive, whereas it belongs to the effect group if ( $D-R$ ) is negative (Wu and Lee, 2007; Wu, 2008). However, there is a primary difference between the duo-theme and one-theme DEMATEL. Since the duo-theme DEMATEL intends to integrate two causal maps into a single PB-PR matrix, the value of ( $D+R$ ) of each factor in PR requires transforming “positive” into “negative” so that the cause-effect factors of PR are located in Quadrant II and Quadrant III, and those of PB are located in Quadrant I and Quadrant IV (Wu et al., 2011). To boost the trust of SaaS adoption, the decision makers need to focus on the two “root factors”—the cause factors of PR (in Quadrant II) and the cause factors of PB (in Quadrant I).

### 2.3 The proposed operational procedures

The operational procedures for implementing the duo-theme DEMATEL are proposed as follows:

- Step 1: Determining the two sets of criteria which represent the duo-theme problem.
- Step 2: Designing the pair-wise comparisons which are scaled by several levels, depending on how detailed the problem would be presented.
- Step 3: Generating the initial direct-relation matrix which is obtained by pair-wise comparisons in terms of influences and directions among criteria.
- Step 4: Producing the normalized direct-relation matrix.

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3 Step 5: Computing the total-relation matrix.

4 Step 6: Combining the duo-theme causal diagrams into a four-quadrant integrated  
5 causal map; then, making use of the causal map to elucidate the causes and  
6 effects of the two themes and further developing effectual interventions  
7 accordingly.  
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### 10 **3. A case study**

#### 11 *3.1 Background*

12 The case university, founded in 1967, is located in central Taiwan. Currently, it has  
13 thirteen academic departments under three colleges—College of Business and  
14 Management, College of Electronics and Computer Engineering, and College of  
15 Engineering. To accommodate the needs of neighboring Science Park and Industrial  
16 Research Center employees, most of the academic departments are offering degree  
17 curricula or non-degree programs for nocturnal students. Besides the academic  
18 departments, the case university also has three major research centers—Glass  
19 Innovation Center, Green Energy Industrial Center, and Hakka Culture Center, which  
20 are renowned in Taiwan.  
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24 The Library and Information Center in the case university aims to cater for the  
25 needs of students, faculty and staff with services, such as providing students and staff  
26 with general software and hardware to update the e-portfolio and maintain their  
27 curriculum records; providing researchers and postgraduate students with special  
28 software and hardware to perform the experiments; and providing a platform for  
29 instructors to develop and share their pedagogical materials in digital format. Like  
30 other universities in Taiwan, the case university has long dedicated to upgrading its  
31 software and IT hardware in order to keep pace with the rapid changes in digital  
32 technologies. However, the Library and Information Center has been facing several  
33 problems such as: having an outdated, expensive and inefficient infrastructure of  
34 mixed old and new desktops; many underutilized physical servers; applications loaded  
35 onto the hard drives located in different buildings; the needs to meet curriculum goals  
36 and to maintain complex distributed computing environments in good order; among  
37 others.  
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40 Fortunately, while the Library and Information Center was looking for ways to  
41 resolve the above problems, a Japanese cloud vendor approached the case university  
42 and offered the internal cloud solutions free of charge as a demonstration project to  
43 test the users' acceptance of the new technology system. Under the Scientific and  
44 Educational Cooperation Project, the internal cloud solutions were introduced to the  
45 case university in the Fall semester 2010, and the case university was required to form  
46 a task force to assess the internal clouds acceptance during the post-implementing  
47 phase.  
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#### 50 *3.2 Results*

51 To assess the acceptance of internal clouds acceptance, the case university formed a  
52 task force which is composed of five key persons: the Vice President, the Director of  
53 Library and Information Center, and three senior IT staff. One the authors was invited  
54 to help implement the evaluation with the proposed duo-theme DEMATAL. After  
55 several meetings the task force concluded to adopt the concept of the core part of  
56 TAM to develop an evaluation framework as shown in Figure 3.  
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**Figure 3.** The evaluation framework for this study

Following the proposed step-by-step operational procedures, the results were presented below. In step 1, the task force referred to Venkatesh and Bala (2008) and modified the criteria in each theme as follows: for theme PEOU it includes four criteria—PEOU1 (interaction with the internal cloud solution is clear and understandable), PEOU2 (does not require a lot of effort), PEOU3 (easy to use) and PEOU4 (easily get the internal cloud solution to do the job). Likewise, for theme PU it also comprises four criteria—PU1 (improve job performance), PU2 (improve productivity), PU3 (enhance job effectiveness) and PU4 (useful for the job). The detailed descriptions of these eight criteria are given in Table I.

**Table I.** Criteria for two themes—PEOU and PU

In step 2, with great seriousness the five key persons revealed their opinions on the eight criteria by pondering upon each of the duo-theme criteria (Table I). A linguistic scale ranging from 0 (No influence), 1 (Very low influence), 2 (Low influence), 3 (High influence) to 4 (Very high influence) was used to measure the opinions. After that, an initial direct-relation matrix was generated in step 3 by the “majority rule” because the purpose here was not to resolve a mathematical problem but simply to achieve a consensus about the “acceptance” of the newly introduced internal cloud service. Table II and Table III present the initial direct-relation matrices for both themes, respectively. In step 4, the normalized direct-relation matrices for both themes were further obtained. In step 5, the total-relation matrices for PEOU and PU were acquired. Finally, an integrated causal map was obtained for use in step 6.

**Table II.** The initial direct-relation matrix for PEOU

**Table III.** The initial direct-relation matrix for PU

Figure 4 demonstrates the resulted PEOU-PU matrix, from which we can visually see that PU4 (I find the internal cloud solution to be useful in my job) is the most influential factor under the theme Perceived Usefulness. On the other hand, PEOU1 (My interaction with the internal cloud solution is clear and understandable) is the foremost concern for the theme Perceived Ease of Use.

**Figure 4.** The resulted PEOU-PU matrix

#### 4. Discussion

Based on the above results, some implications and intervention activities are discussed. In Figure 4, one can visualize the causes and effects associated with the two themes, respectively. For the theme PEOU, on one hand, we see that the cause group includes PEOU1 and PEOU3, while the effect group embraces PEOU4 and PEOU2. In particular, PEOU1 (My interaction with the internal cloud solution is clear and understandable) is more imperative than PEOU3 (I find the internal cloud solution to be easy to use), which is, in turn, more crucial than PEOU4 (I find it easy to get the internal cloud solution to do what I want it to do) and PEOU2 (Interacting with the internal cloud solution does not require a lot of my mental effort). It implies that at the beginning usage stage, clear understanding and operational ease, rather than better accessibility or less mental effort, are more necessary for making progress of the internal clouds acceptance. It also reflects that the case university may still encounter some challenges in advancing the internal clouds due to lacking enough



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3 training or promotion activities.

4 For the theme PU, on the other hand, it is clear to see that the cause group includes  
5 PU4, PU2 and PU1, while the effect group only embraces PU3. In particular, both  
6 PU4 (I find the internal cloud solution to be useful in my job) and PU2 (Using the  
7 internal cloud solution in my job increases my productivity) are more imperative than  
8 PU1 (Using the internal cloud solution improves my performance in my job), which,  
9 in turn, is much more crucial than PU3 (Using the internal cloud solution enhances  
10 my effectiveness in my job). It implies that at the beginning usage stage, improved  
11 usefulness and productivity, rather than increased performance or effectiveness, is  
12 more demanded for implementing the internal clouds acceptance. It suggests that the  
13 case university need to focus on lower-level expected outcomes (usefulness and  
14 productivity), rather than higher-level ones (performance and effectiveness) at the  
15 early stage. Perhaps it reflects the fact that the case university is still not familiar with  
16 the internal cloud solutions and lacking expertise to control it.

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20 Based on the findings, the case university is suggested to exercise necessary  
21 intervention activities (such as training, organizational support, and peers' support) to  
22 enhance the level of acceptance of this newly introduced internal cloud solutions. To  
23 this end, this paper further undertook a post-survey by discussing with the task force  
24 members, and the results are summarized as follows. (1) Regarding the purposes of  
25 launching the internal cloud solutions, the Vice President highlighted that the merits  
26 of the internal clouds should leverage educational competitiveness in meeting future  
27 challenges. (2) The Director emphasized the legislation concern, rather the economic  
28 consideration, because the internal cloud solutions can be a positive way to tackle the  
29 issue of the personal data protection. (3) The senior IT staff stressed that people are  
30 not willing to accept the internal cloud solutions because they lose the convenience to  
31 use computers such as installing their preferred software freely.

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34 Based on the post-survey, some necessary intervention activities are proposed in  
35 order to make the users feel that the internal cloud solutions can enhance their job  
36 performance and that they have abilities, with necessary supporting resources from  
37 the university, to use the internal cloud solutions effortlessly. For instance, the case  
38 university can take promotion strategies such as using the internal cloud solutions to  
39 handle the issues related to the personal data protection as a slogan. Furthermore, to  
40 reduce the resistance from using the internal cloud solutions, it is recommended to  
41 take the following interventions: developing attractive training programs, creating  
42 interesting workshops, rewriting user friendly manual or handbook, evaluating  
43 individual's job performance with incentive/rewarding system, and so on. Referring to  
44 van Rooij (2011), the organizational culture can affect the "acceptance" of new  
45 technologies; a successful implementation of new technologies can also result in  
46 better organizational culture. With this, it is anticipated that each of the  
47 aforementioned intervention activities would eventually enhance the individuals'  
48 acceptance of internal cloud solutions as well as ameliorate the university's  
49 organizational culture as a whole.

## 54 55 **5. Conclusions**

56 The use of new technologies, such as internal clouds, may advance an organization's  
57 competitive advantages. However, even if introducing a new technology system, low  
58 acceptance of usage by the organization's members can lead to financial losses and  
59 bad organizational culture. The internal clouds are in general more promising than the  
60 external clouds due to the concerns of control, vendor lock, security, privacy, and  
reliability; however, barriers in different formats may still exist even if in the

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3 post-implementation phase. The conventional one-theme DEMATEL seemed  
4 insufficient to fully capture the whole pictures involving two themes like the case  
5 study. Hence, this study has contributed to develop the operational procedures of  
6 duo-theme DEMATEL to assess the acceptance of usage of internal clouds in a  
7 university in the following: it satisfactorily grasped the causal knowledge in terms of  
8 Perceived Ease of Use (PEOU) and Perceived Usefulness (PU) at the same time; it  
9 produced a four-quadrant integrated causal map, which manifestly displayed  
10 perceivable and comprehensive information to facilitate the decision makers to focus  
11 on the “root causes” of each theme to develop more effectual intervention actions. In  
12 sum, this study has successfully provided a new evaluation framework that  
13 simultaneously deals with two distinct themes; and furthermore, recommended  
14 appropriate intervention activities to foster the acceptance of cloud services usage in a  
15 university, and, meanwhile, to avoid making likely biased decisions.

16  
17 It is inevitable that the present paper has some limitations, which require further  
18 studies. First, this study only conducted a case study on a university; hence, the  
19 findings should not be generalized to other universities or enterprises. Application of  
20 the proposed duo-theme DEMATEL to other educational institutes or organizations  
21 deserves further exploration. Second, it is only a starting point to examine the  
22 acceptance of internal cloud solutions for the case university. As time goes by,  
23 dissimilar problems or hurdles may emerge, thus, it calls for periodical diagnoses in  
24 order to grasp the dynamic “acceptance” of the internal cloud usage with different  
25 intervention activities and promotion strategies. Third, the proposed duo-theme  
26 DEMATEL is a powerful tool for better decision-making, yet it is more suitable for  
27 exploring the micro-level causal knowledge. It is important to further elaborate the  
28 duo-theme DEMATEL to acquire the macro-level causal knowledge as well. Finally,  
29 the real world problems usually involve complex and intertwined cause-and-effect  
30 factors that may be grouped into more than just two themes. As such, developing a  
31 multi-theme DEMATEL evaluation framework deserves further research.

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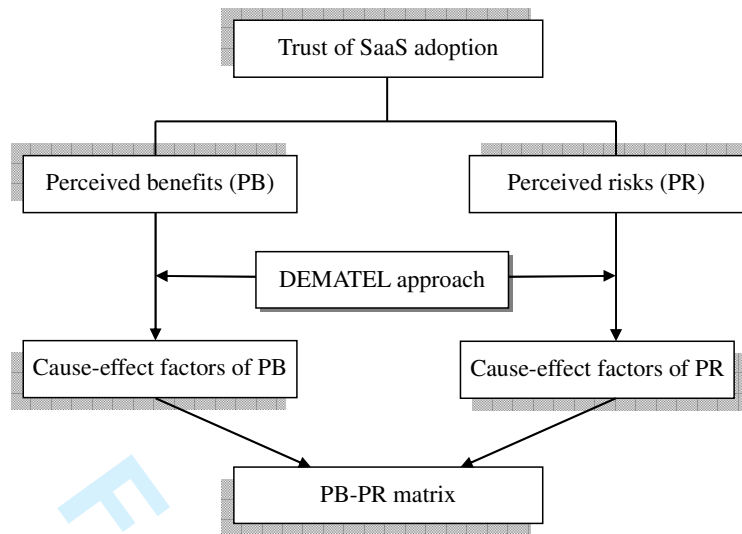


Figure 1. The evaluation framework for trust of SaaS adoption (Wu et al., 2011)

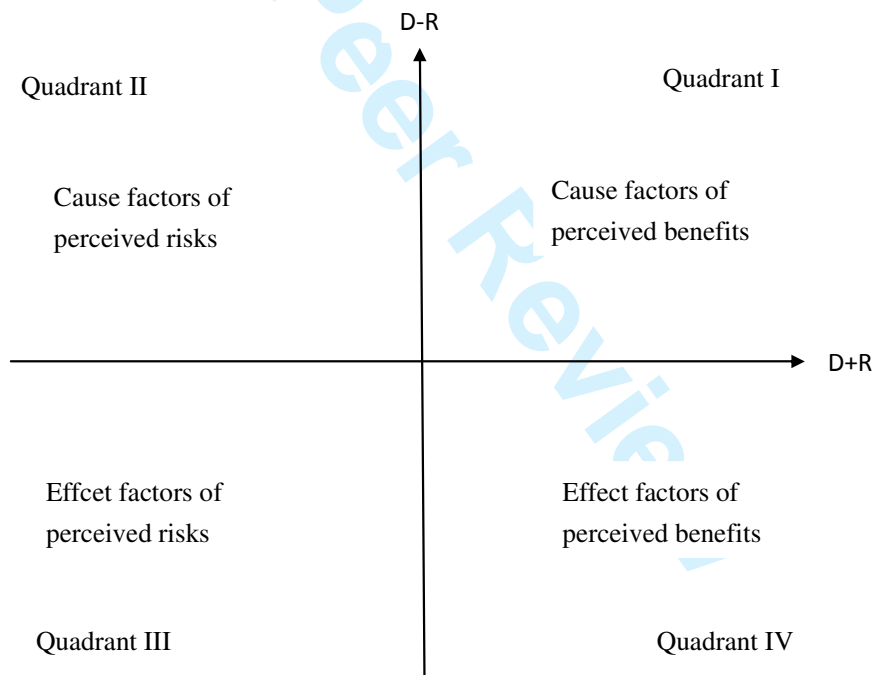


Figure 2. The four-quadrant causal map (Wu et al., 2011)

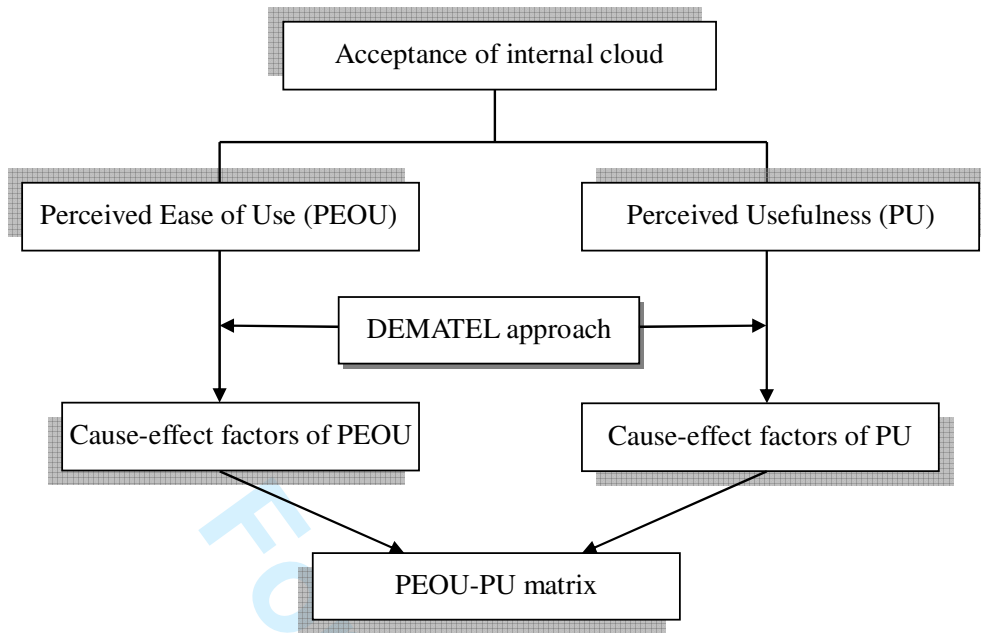


Figure 3. The evaluation framework for this study

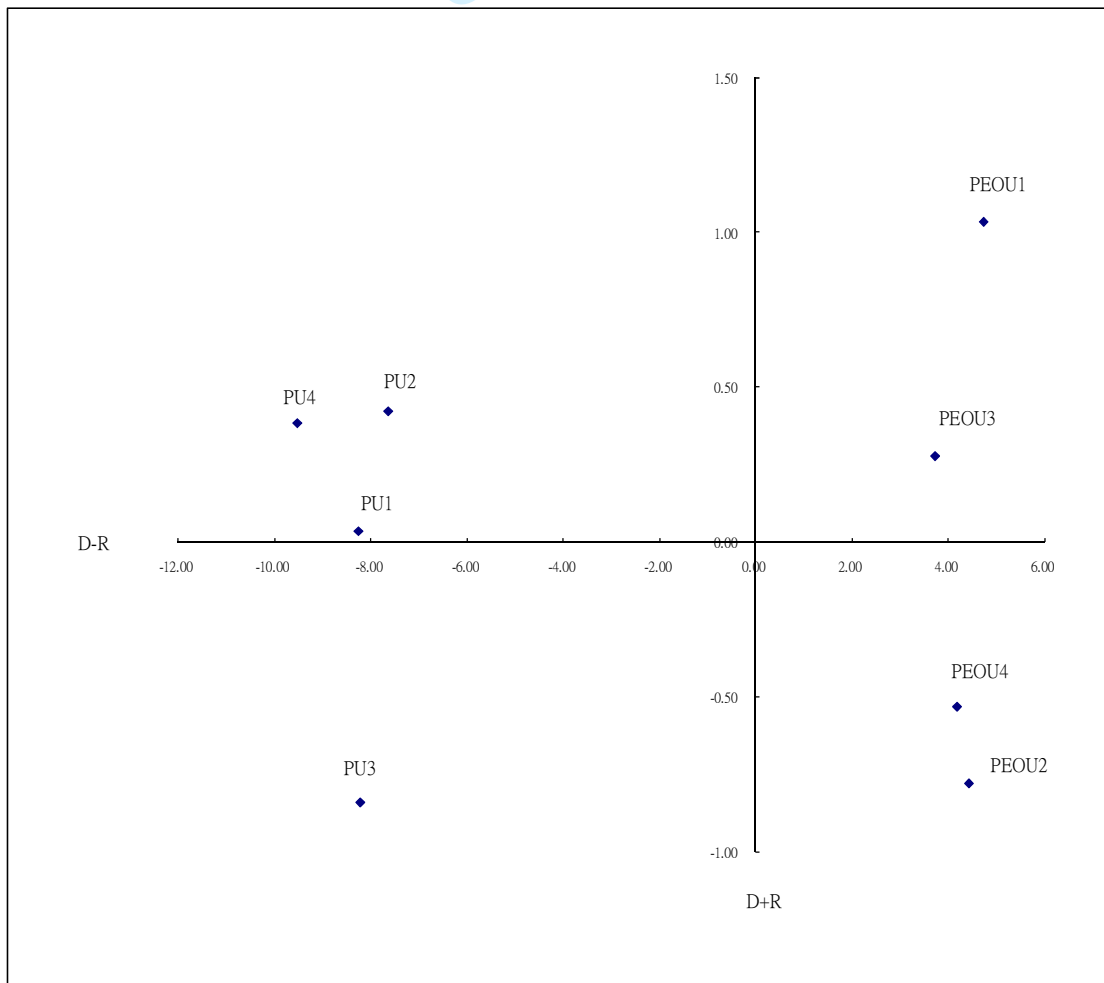


Figure 4. The resulted PEOU-PU matrix

**Table I.** Criteria for two themes—PEOU and PU

Evaluation criterion	Description
PEOU1	My interaction with the internal cloud solution is clear and understandable.
PEOU2	Interacting with the internal cloud solution does not require a lot of my mental effort.
PEOU3	I find the internal cloud solution to be easy to use.
PEOU4	I find it easy to get the internal cloud solution to do what I want it to do.
PU1	Using the internal cloud solution improves my performance in my job.
PU2	Using the internal cloud solution in my job increases my productivity.
PU3	Using the internal cloud solution enhances my effectiveness in my job.
PU4	I find the internal cloud solution to be useful in my job.

**Table II.** The initial direct-relation matrix for PEOU

	PEOU1	PEOU2	PEOU3	PEOU4
PEOU1	0	3	3	3
PEOU2	2	0	1	2
PEOU3	1	3	0	2
PEOU4	2	2	1	0

**Table III.** The initial direct-relation matrix for PU

	PU1	PU2	PU3	PU4
PU1	0	2	2	3
PU2	2	0	3	2
PU3	2	1	0	3
PU4	3	3	3	0