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Living with ERP: A Sand Clock Model of End User Problems

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Abstract

Although a number of studies highlighted problems related to ERP systems, most of these studies focus on the problems during the project and implementation stages but not during the post-implementation process. Problems encountered in the process of using ERP would hinder the effective exploitation and the extended and continued use of ERP systems and their value to organisations. This paper investigates the different types of problems (operational, supervisory and managerial) users faced in using ERP. The paper adopts a qualitative method and uses data collected from two cases and 26 interviews to inductively develop a theoretical model in classifying ERP usage problems. A sand clock model of ERP usage problem is formulated to classify the identified problems into data quality, system quality, interface and infrastructure. The theoretical contribution of this paper is in gaining deeper insight on the impediments to effective use of ERP. From the practical point of view, this paper could assist managers to reach the sources of problems encountered by end-users and overcoming them.

Keywords

Post Implementation, Sand Clock Model, ERP system, Usage Problem, Case Studies

INTRODUCTION

Generally, most of the post implementation ERP research takes an organisational rather than end-user perspective (Esteves & Bohorquez 2007; Moon 2007). Post implementation ERP studies from an end users perspective are rare. The existing end users specific studies tend to focus on adoption (Amoako-Gyampah, Kwasi 2007; Chang et al. 2008) and usage (Kwahk & Ahn 2010; Longinidis & Gotzamani 2009) and usually draw from Technology Acceptance Model (TAM) or Diffusion of Innovation Theory (DOI). A few focus on users' absorptive capacity (Park, J-H, Suh & Yang 2007). In the context of ERP where usage tends to be mostly obligatory rather than voluntary, a focus on adoption and usage does provide only limited insight as to the difficulties end users face and their coping mechanisms in continuing to use ERP. Despite a large number of previous studies examining ERP system problem during the implementation phase, few reveal the usage problem encountered by end users during the post implementation phase. There is therefore a need for a research to understand the problems ERP users face in using the system.

The usage problems in the post implementation stage of ERP also could result in failure to achieve the promised ERP benefits (Yu 2005). Issues such as lack of trust on ERP system, resistance of changes from users, ineffective training methods and complexity in extracting data from ERP system would hinder the effective exploitation and the extended and continued use of ERP systems and their value to organisations. Boudreau and Robey (2005) which studied users' enactments suggested that although mandated to use ERP system, the institution's users initially found way to avoid them by reproducing work practices they have followed prior to ERP implementation. In such situations, users might not necessarily rely on the main system (ERP) sanctioned by the organisation. Therefore, it is crucial to investigate the usage problem in order to ensure the continuance use of this highly integrated system. Thus, the goal of this paper is to investigate the research question of ***"What kinds of problems do users; operational, supervisory and managerial, usually face in ERP system deployment?"*** The paper adopts a qualitative method and employs the grounded theory approach to data analysis. It inductively develops a theoretical model, which we call "A Sand Clock Model of ERP Usage Problem". The model classifies the problems into data quality, system, interface and infrastructure.

The remaining of this paper is organised into four major sections. First, the background literature on ERP problem is presented. This section will cover the ERP continuance usage and problem encountered in using ERP system. Then, we outline and discuss the research method. Following that, we demonstrate the analyses and

findings from two cases. Subsequently, we present the discussion on the problems and a classification model of ERP Usage Problem. The last section offers the concluding thought.

BACKGROUND LITERATURE

ERP Usage Problems

System usage has played a major role in the IS literature and success model. An effective system usage is a major determinant of productivity (DeLone & McLean 2003). The effectiveness of investment in information system (IS) can be partly explained by the continuous usage of installed systems. Therefore, the research on 1S user retention is important from both practical and academic perspectives. The emphasis on IS continuance research ranges from the employment of IS adoption as an independent variable for explaining IS continuance (Chiu et al. 2005), through the study of IS continuance in the mandatory environment (Sørebø & Eikebrokk 2008) to the mechanisms used in explaining the evolvement of continued use over time by elucidation of established continuance theory (Limayem & Cheung 2008).

The usage continuous construct is also applicable in the ERP context since ERP's benefit can only be realised if users continue to use the system. Yet, implementing ERP usually entails high cost, and successful ERP implementation (initial stage of ERP) does not necessarily lead to the success of ERP post-implementation (middle stage of ERP) (Rajagopal 2002). Problems encountered by users will discourage them for continually using the system. Issues such as lack of trust on ERP system, resistance of changes from users, ineffective training methods and complexity in extracting data from ERP system could lead to users' resistance or refusal of or building way around to ERP systems (Houghton & Kerr 2006). Various problems in the use of ERP during the post implementation phase can lead users to create their own information system or workaround the system in order to accomplish their job (Behrens & Sedera 2004; Houghton & Kerr 2006).

Table 1: Problem of ERP System

Authors	ERP Problem /Usage	Description
Topi, Lucas & Babaian (2005)	System Support Service	-Identification and access to the correct functionality, transaction execution support, system output limitations, Terminology problem, system complexity - Support in error Situation
Soja & Paliwoda-Pekosz (2009)	 Employees Enterprise System IT Infrastructure Implementation Process Vendor	(Sources of ERP Problem) Fear, reluctance, skills, habit, knowledge Changes in the enterprise Errors and Too complicated Change in network architecture & hardware requirement Duration time, employees, project definition Lack of sufficient resources, consultants
Elbertsen, Benders & Nijssen (2006)	ERP Complexity Compatibility IT Competence Seller's marketing effort	The ERP adoption is significantly related to ERP complexity (positive), ERP compatibility (negative), IT competence (negative), and ERP sellers' marketing efforts (positive).
Lin (2010)	Usage of ERP system affected by: Information Quality System Quality Top Management support	The results show that information and system quality directly or indirectly affect ERP system usage through user perceptions of usefulness and satisfaction with the ERP system. Additionally, top management support influences both perceived usefulness and ERP system usage
Usher & Olfman (2009)	Post Implementation Problem	Difficulty diagnosing and solving problems Data integrity issues * Lack of process discipline Non-use of the system Lack of metrics for surfacing issues Users were not knowledgeable about how to use the new system

Prior research on the ERP usage problem is very much lacking. The above table (Table 1) summarised ERP problem and usage issue during the post implementation phase. For instance, Topi, Lucas & Babaian (2005) categorised the usage problem based on system and support. In order to improve the system design, it is crucial to identify the factors affecting users' ability to use the system effectively. Thus, the potential impact of enhancing the usability such as better understanding of system usage will help in saving the organisation time and money by lesser training cost, faster ramp-up times and completing the assigned task. Others have also

looked at factors that influence an organisation's use of ERP system and nature of difficulties experiences during ERP system adoption (Elbertsen, Benders & Nijssen 2006; Soja & Paliwoda-Pekosz 2009). Other examples of previous study on ERP usage problem is further illustrated in **Table 1**.

In sum, the literature review reveals three gaps in the existing study of ERP system implementation problems. (1) most of the previous studies tend to emphasise on the problem of ERP implementation project (before ERP being rollout), but not the real usage issues after the ERP system has been implemented (post implementation phase) (2) the literature also focuses on organisational rather end user level of problems in using ERP system (3) there is no model to illustrate the classification of usage problem by end user.

RESEARCH METHOD

This research utilised qualitative research approach using multiple case studies. Exploratory case study is useful for studying complex phenomenon in their natural setting and appropriate for new topic areas (Eisenhardt 1989; Yin 2002). Four large organisations from Malaysia that have implemented ERP systems were approached. Two agreed to participate, which we will refer here as Case A and B. The selection criteria of these organisations were the following: (1) the company has implemented ERP (SAP) system more than 3 years that can provide sufficient maturity for us to study the ERP system use issues (2) Based on large organisation that has use similar system, SAP R/3 and (3) They have agreed to participate in the study since the accessibility issues is critical point in a case study type of research. Data were collected through face to face interviews with 26 interviewees where 17 are male and 9 are female. The interview is conducted over a period of 3 months from 15th March 2010 until 15th June 2010. Each interview lasted between 1 hour to 1 ½ hours. The interview questions were open ended in nature with additional questions expanding on emerging themes. Case A has 13 years of experience of using SAP system (from 1997 till the site visit, 2010). While, case B has 8 years of experience in using SAP system (from 2003 until the site visit, 2010). The summary of the Interviewees demographic profile is provided in the following table.

Table 2: Demographic Profile of Interviewees in Case A and B

Case	No. of Participants	Departments Covered	Job Responsibilities	Participants Code	Participants Gender
A	13	-Engineering and Services - Operating Performance & Improvement - Plant Operations - Technical Service - Human Resource Management -Finance and Planning	- Senior Manager (1), Executive (2), - Manager(1) Executive (1), Clerk (1) - Manager (1), Executive (1) - Manager (1) - Executive (1), Supervisor (1) - Manager Executive (1)	M1, E2,E3 M4, E5, C6 M7, E8 M9 E10, S11 M12, E13	M, M, F M, M, F M M M F M F M
B	13	-MIS/SAP -Finance -Production Planning Control -Purchasing Vendor Development	- Senior manager (1), Manager (1) , - Internal Consultant (2) - Manager (1), Assistant manager (2) Supervisor (1) - Executive (1), - Supervisor (1), Clerk (1) - Assistant Manager (1), Clerk (1)	M14, M15, E16, E17 M18, M19 M20, S21 E22, S23, C24 M25, C26	F M M,F M F, M F M M M M F

Data analysis was performed using the grounded theory method approach proposed by Strauss and Corbin (1998). We start with the transcription of the interviews. Since the interviews were conducted in mixed language (English and Bahasa Malaysia), the data was translated into English. This process was carried out to facilitate the analysis process as well as to provide consistency in data transcription. To ensure validity, a third party verified the translation of interviews from Bahasa Malaysia to English. Open coding was used to analyse the data as suggested by Strauss and Corbin (1998). Using the open coding, categories along with their properties and dimension are extracted from the raw data. The process of coding is an iterative process where we detect the

expressive statement in data and form the relation between these as suggested by Oliver, Whymark et al.(2005). In order to ensure the reliability of the emerged coding we adopted the double coding method as proposed by Boyatzis (1998).Through this method, the three researchers observe the raw information independently (as the raw information being recorded). Each of the researchers makes judgments without interacting or seeing the judgment of the other two. Then, the researchers compare the result and discuss each observation until agreement is reached.

CASE STUDIES

Case Description Background

Case A is a subsidiary of leading Oil and Gas Company in Malaysia incorporated in 1997. This company implemented SAP (Systems Application and Products) in 1997, and upgrades its system in 2000. This is due to some limitation of the early SAP version. The four main SAP module currently used in case A are Material and Management module (Triple M) for the Procurement side, Financial Information and Costing (FICO) for the Finance and Planning department, Human Resource Information System (HRIS) for Human Resource department and Plant Maintenance Module (Engineering and Services). The development of any information system in case A must be authorised by either the IT Department Unit, or Corporate Information Development Unit (CIDU). These two units share the responsibility of overseeing all information systems. In 2004, case A has outsourced its information system development, maintenance and upgrade work to IPerintis.

Case B is a public limited company in Malaysia incorporated and domiciled in 1991. The company produces a range of automotive components such as providing expertise in the power engineering and railway sector and industrial automation and automatic tank cleaning services to several industries. Case B has implemented SAP since 2003. There are five core SAP modules used in case B. These modules are Financial (FI), Cost Controlling (CO), Material Management (MM), Production and Planning (PP) and Sales and Distribution (SD). The development of any information system in case B must be authorised by Management Information System (MIS/SAP) department. This department is responsible to oversee and managing all information systems development, maintenance and upgrading process.

Problems and Issues in Using ERP

A qualitative analysis of the 26 interviews led to four categories of the ERP system used in these two organisations. Problems reported inclusive of the Data Quality, System, Interface and Infrastructure. **Table 3** illustrates some of the selected quotation as an example to show the extent of problems encountered by SAP (ERP) users in both cases.

Table 3: Issues and Problem of SAP system Usage

Data Quality Problem			**F**
Untimely	The SAP data is out of date	A clerk from PPC department of case B highlighting the untimely issue: *"Data need to be keyed in into SAP daily basis but as for now I am unable to do it. This is because there was no cooperation between departments."*	5
Inaccuracy	The recorded value in SAP is not in conformity with the actual value	A finance manager of case B commenting on data accuracy *"Normally, the amount in SAP never is the same, seldom it matched, sometime we have more but sometime we have less"*.	5
System Problems			**F**
System Functionality	Complexity- the complexity of SAP features	An Internal consultant of MIS and SAP department from case B highlighting the complexity issue of SAP: "….. *[…]…For example, the first step of the 'Back flush' process is to do 'transfer posting' (which sources of the raw material to be used). However, if user skips some of the steps it will affect the overall process. Yet, what actually happen was that user usually avoided some of the steps in SAP for the back flush process, as it is too troublesome for them."*	7
	Unavailability- The unavailability of SAP's required functions.	An executive of Engineering and Service department from case A emphasising the unavailability of scheduling function from SAP system: *"One of the SAP problems is in term of the scheduling function, as we could not find that function from the system."*	5
System Problems			
Usability	Inoperability -	A manager of Technical Service department of case A	4

problem	SAP users unable to operate some of SAP functionalities in a correct manner	explaining on system usability issue "*the problem that I face (I would refer to myself) is to select the function to be used. ….[….]…. So, the typical challenge that I face is to select the function and how to go about to approve certain request."*	
	Learnability – SAP users are incapable to learn and use SAP system functionalities in a correct manner	A PVD Clerk from case B commenting on the learnability issue of SAP: "*Our main challenge in early the stage is like me, we do not understand the flow. It is difficult for us when we have this problem. We are able to do the basic and the required task only. We are not aware of the impact to others. I felt this way before and I believed it is the same with the new staff. We are afraid to try other things."*	4
Interface Problems			**F**
Poor Input and Screen Design	The design of SAP's screen is not attractive/user friendly for user to use SAP	A Comment made by an executive of Operating Performance and Improvement (OPI) department of case A: *"The SAP interface is not user friendly. All the icons and buttons are on the top. Therefore, we need to click one-step and open the next page and do it again. It has too many screens, too many steps to get to what you want. Sometimes I got bored. If you login to the system, you need to know what to do next and which category need to be found. From my observation of colleagues who are using SAP, they have their own notebooks to write all the steps on doing certain process. If you skip one of the steps it will create a problem later."*	6
Infrastructure Problems			**F**
Inadequate capability of Networking and Server	IT infrastructure capability (including server and networking capacity)	*Quote from an* assistant manager of PVD department of case B: *"System is quite slow; it got to do with the server. So, if we need some goods urgently, it is quite difficult to use SAP. How we are going to proceed if the server hang or system become too slow. In my opinion, our problem is lies on the server itself.*	4

*** F- Frequency of Recurrence**

Data Quality Problems

In both case A and case B, the data quality problems are one of the common problems raised by the users. The data quality includes **untimely** and **inaccuracy** of SAP data. The **untimely** issue of SAP data is best exemplified through the receiving of inventories in the Purchasing Vendor Department (PVD) of case B (refer to table 3). In the receiving unit (part of PVD department), some receiving clerk did not record the goods received on the daily basis. The data entry was collectively done at the later stage. The failure of the receiving staffs to record the inventory received on the daily basis resulted on the delay in generating the stock information. This is considered critical since it is important for the Production Planning and Control (PPC) department to get the updated inventory information. As the PPC supervisor noted*: "We need immediate information when goods are received. However, when there is a delay in the process, we need to do another stock take."* The frequent stock taking indirectly disrupts the smoothness of transaction flow especially for the goods receiving process.

Examples of the untimely of data entry raised by the different interviewees in case B above highlighted the common issue where data is not keyed in daily or during the required time. This problem is derived from the lack of discipline. Comment from a senior manager of MIS and SAP department of case B stressed this issue: *"Users have to discipline themselves in order to key in the data. For instance, they need to key in the Goods Received immediately so that it must be in a real time basis. Otherwise, it will affect the related process. However, practically it does not happen. It is not good and not really up to the required level."*
The interview results have also identified a number of incidents of **data accuracy** problem in both cases. The inaccuracy of data recorded in the system (SAP) is found in both cases. For example, the inaccuracy of SAP data occurred in the Engineering and Service department of case A, during the calculation of the MTBF (mean time between failures) for equipment. An executive of Engineering and Service department expressed her concern about this problem: *"One thing lacking in SAP at the moment is that the calculation of MTBF (Mean Time between Failures). This is* b*ecause SAP cannot generate accurate data to assign the related MTBF for the specific equipment. We are facing some* problem to track down interval time of the equipment failures through SAP due to inaccuracy of data from the system*"* In case B, examples of inaccuracy problem in using SAP is illustrated in the following Table 4.

Table 4: Summary of Inaccuracy of SAP Data of Case B

Where	What	Interview logs
Receiving department	Users do not input all data received from the suppliers for free of charge goods (FOC) into SAP	A Production and Planning supervisor noted *"We receive the free of charge (FOC) items together with the goods during the receiving process. For example, our customer usually gives the CKD free. Since there is no cost involved, the user thought that it is not important for them to key in the data into SAP. However, they forget that this will affect the later process like Good Transfer. We cannot do the Good Transfer process on time because the data is not accurate anymore."*
Production and Planning	SAP data duplication	A PPC supervisor highlighted inaccuracy issue: *"For example, within past two month when I made some reconciliation, I found that there are many triple key in for one Delivery Order. This means that we have overpaid our suppliers."*

System Problems

Two of the issues that came up repeatedly during the interviews relate to the **system functionality** and **system usability**. The ***system functionality*** issue covers two main areas: complexity of SAP features and unavailability of the SAP's required functions. An example of complexity issue encountered by user is illustrated in table 3. In this example, an internal consultant from MIS and SAP department of case B suggested that due to the complexity of SAP, user avoided the required steps in completing one of the processes (backflush process) in the PPC department of case B. Other examples to illustrate the complexity issue of SAP system is outlined in **Table 5**.

Table 5: Summary of Complexity Problem of SAP Data of Case B

Where	What	Interview logs
Human Resource Management & Administration (HRMA) at case A	The SAP system design is rigid and not user friendly	An executive of HRMA noted: *"SAP Itself is very rigid. I do not know how they program the system.... […]…. initially we want to explore and use many of the features from the system. Nevertheless some of the features are not friendly enough to be used."*
Finance department In case B	The SAP system unable to fulfil the expectation in simplifying work	The Assistant manager of Finance department stated: *"Actually, I expect SAP is able to simplify my work in which we can rely on it."*

In addition to the complexity problem of SAP, another common problem of system functionality is on the unavailability of SAP's required functions. Functionality refers to how well the technology matches the functions it was intended to perform. However, the unavailability of required functions in SAP becomes one of the crucial problems reported in case A. Such as where the scheduling and planning of the project in the Engineering and Service department of case A carried out outside the SAP system, *"We use SAP to plan the work but to schedule it we need to use Microsoft Project. I would like to give an example. If we shut down our plant for 7 days and during that period we have 100 jobs to be completed, we need to divide the 100 jobs within 5 days; we have to use the scheduling program like Microsoft Project since SAP does not have the scheduling function."*(Executive of Engineering and Service department)

Besides system functionality problem, users also face issues related with the usability of the SAP system. ***System usability*** problem referred to inoperability and learnability issue. The definition of these problems is provided in table 3. The inoperability issue raised up by interviewees from both cases indicated the difficulty in selecting and using the required function. For example, some of SAP user argued that to find the specific functionality within SAP and accomplishing certain task required unreasonable amount of effort. An example of the inoperability issue in case A is highlighted in table 3 above. Additionally, the problem to operate and use SAP system pointed out by an executive of Finance and Planning from the same company. She mentioned about her problem to use SAP system as she said: "*As I told you previously, the problem and challenges in using SAP is more to the knowledge on SAP usage. For example, we do not know how to use some functions. So, to overcome it, we have to refer to other expert."*

The system usability problem is also associated with learnability of end user to learn and use SAP system. In case A, learnability issue is pointed out by the Finance and Planning executive. She admitted that her lack of knowledge contributed to the usage problem of SAP. From her quote: "*Due to my lack of skills, I was not able to solve some of the SAP problem occurred.. For example, when I am doing the month end closing, I was unable to close some of the project balance that I have created earlier, because the same figure reappears…[…]..Besides this, I am not yet fully explore the SAP functionalities. I just do whatever is required*

by my section." A similar type of problem is also pointed out by a PVD clerk from case B. The learnability issue arise when the new SAP users are having some problem to understand the current business flow. Their lacks of understanding on SAP confined them to their basic task and they are afraid to try new things (*refer to example of table 3 above).*

Interface Problems

The SAP screen design has also contributed to SAP usage problem. Users often found that the design of SAP's screen is not attractive enough and therefore discourages them to utilise the system more effectively. The poor SAP screen design is also demonstrated when users are required to execute needless actions to arrive at their desired outcome. For some of SAP users, this situation is considered tedious and sometimes boring as illustrated by comment made in table 3. In addition to that, the Finance and Planning executive from case A also highlighted the interface problem with the preparation of purchase requisition in her department. She found that "*…, in approving the purchase request, we cannot just simply select the function. There is a lot of jargon that I think is not useful. For the technical people, maybe they can appreciate it"*

A manager of Plant Operations department of case A supports the above statement as he commented on the interface problem of SAP. From his comment: *"In my case, I think SAP interface needs to be more user friendly. Currently, the interface of SAP is quite complicated. You need to be sure how the system work before you can use it. I think if they can provide a more user friendly interface or prompt, it will be much better to guide you through especially for a novice user."* In case B, The same view above is also shared by the MIS and SAP senior manager of case B. She acknowledged the current interface contributes to the existing SAP problem in case B: *"Yes I must admit that sometimes SAP screen are bit overkill. In a sense that it has so many not so valuable field that are not supposed to be there in the first place."* SAP design is also considered as not user friendly as other application. The Assistant Manager of Finance has highlighted this interface issue in case B, when she compares the SAP system with the Oracle or IBM application, which have easier interface. She argued that the SAP system itself is quite complicated. Remark made by her: *"Other system is easier to be understood and straightforward. SAP is quite complicated but it has more accountability. Just that it is quite difficult to understand as well as operating it."* Other example of interface issue pointed out by respondents is associated with the design of SAP .The system design is considered unfavourable. A PPC executive of case B stated: "*The SAP screen seems awkward at first, but then once you have already used to it, you will enjoy using it especially the tracking part."*

Infrastructure Problems

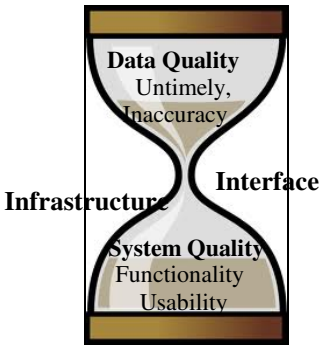
Infrastructure problem is also identified as one of the problem faces by end user in using SAP system during the post implementation phase, The IT infrastructure that is, the hardware, systems, software, and services used across an organisation constitutes the basic prerequisite for ERP implementation and serves as the foundation upon which SAP systems and capabilities are built. The infrastructure problem also denotes the network problem. In case B, network issue represents by the existing problem with server as raised up by the respondents A PVD assistant manager of case B highlighted the *"System itself is quite slow; it has got to do with the server. Therefore, if we need some goods urgently, it is quite difficult to use SAP. How we are going to proceed with our transaction processing if the server hang or the system become too slow. In my opinion, our problem lies on the server itself.* Another respondent, the manager of MIS and SAP department also pointed out about the problem with networking in case B. As he stated; "*It is quite difficult to say since it is not a regular problem. For example, we are facing problem with the network which slows down our work in SAP."*

The Assistant Manager of PVD added that they have requested to upgrade the current server. At the time of the site visit, the server is already upgraded. Thus, it has a better performance as compared previously. Yet, sometimes the server problem is still unavoidable, although he (the PVD assistant manager) admitted it is not as frequent as before. The same manager believed the cause of this problem is due to the lack of budget. Sometimes the allocated budget for SAP maintenance has been used for the other purpose that is considered a priority by the management rather than SAP. MIS manager of case B also stressed on the network problem. He mentioned that one of the problems that end user encountered in using SAP is networking, although this problem is considered rare. He said, "*At our site, we have to take care of network, firewall and communication line to make sure that user can used the system efficiently, But, It is quite difficult to say since it is not a regular problem. For example, we are facing problem with the network.*"

DISCUSSION

The results illustrated many issues encountered by end users when using SAP system. Users in both companies (A and B) faced a number of problems pertaining to data quality, system, interface and infrastructure. From this, we propose a "Sand Clock Model of ERP Usage Problem' (**refer to Figure 1**).

Figure 1: A Sand Clock Model of ERP Usage Problem



The ***Sand Clock*** is an interactive metaphorical representation of ERP usage problem that represents the importance of taking remedial action based on our finding from case A and B. The classification of the problem in a sand clock model **(refer to figure 1)** determine its need for timely attention on how soon the organisation can overcome the data quality through Infrastructure interface in addressing the system quality issue. Delay in solving data quality problem would contribute to more significant system quality problem as shown in the bottom of a sand clock model. Consequently, in serious situation, it would possibly lead to a total system failure (Langenwalter 2000). The shape of a sand clock model determines the critical ERP system issues, the wider shape of a glass symbolised the problematic ERP usage areas compare to a slimmer shape. For instance, the wider shape of the hour glass for data and system quality problem also delineates the intensity of the problem found in this study However; the infrastructure interface represents the bottle neck issues that could potentially create serious system quality issue if it is not being addressed properly.

Timely Attention on Addressing Data Quality Issue

Based on our study, data quality problem triggers the severity and necessitate a timely attention of the sand clock model from two aspects, (1) Untimely of data and (2) Inaccuracy of data. Firstly, issue about data timeless was found in delay in data entry by the receiving unit of PPC department resulted on the discrepancies between the recorded data of SAP and the actual inventory exists in case B. Case A's PPC supervisor believed that when SAP user does not key in the specific cost timely, it would definitely affect the subsequent process which will lead to inaccurate data in SAP **(see table 4)**. In addition, case A and B show a similar pattern on the problem end user encountered relating to the inaccuracy of SAP data. For example, in the later case, SAP data duplication caused by this problem (as discussed in the finding section) resulted on the overpayment to the company's suppliers. As SAP is an integrated system, this error could pass through the whole system unnoticed. Besides, the existing data quality problem of SAP found had disrupted the consistency of information delivered throughout the organisation. Hence, SAP was unable to provide organisations with timely useful information which defer the purpose of such costly implementation.

It is important to address the quality of data or information as early as possible because, data quality issue is known as one of the major determinants of ERP success and usage (Gattiker & Goodhue 2005; Zhang et al. 2005). Thus, the data quality issues (untimely and inaccuracy) found in case A and B, need to be addressed since neglecting the importance of data management will later cause additional resources required in correcting data error (Haug, Arlbjørn & Pedersen 2009). In fact, it has been suggested that data problems get intensified when ERP systems are used, because the ERP modules are intricately linked to each other, for which reason poor quality data input in one module may negatively affect the functioning of other modules (Park & Kusiak 2005). Besides, delay in overcoming the data quality problem of ERP system will also contribute to the ERP (SAP) system failure. For instance, problem in the data quality could cause disaster for ERP system due to the integrated nature of the system (Xu et al. 2002). According to Xu et al (2002), implementing an ERP could possibly resolve some of the data quality problems, because an integrated system like SAP provides organisations with useful information in a timely manner. However, due to its integrated nature, it becomes the downside of the system, as inaccurate and untimely data entered into SAP will lead to usage problem. Hence, if these problems are not being address in timely manner, it would possibly lead to SAP system failure. Previous studies have highlighted the data quality problem related to the accuracy (Haug, Arlbjørn & Pedersen 2009; Wand & Wang 1996). Haug, Arlbjørn & Pedersen (2009) proposed a classification model for evaluating data quality in ERP projects and defined the main causal relationships between categories of data quality dimensions which comprised of intrinsic data quality dimensions, accessibility data quality dimensions and data usefulness dimensions.

Timely Attention on Addressing Interface Infrastructure Issues
Next, the classification of interface infrastructure problem in a sand clock model is illustrated by the slimmest shape structure of the glass. This entailed that, even though the interface infrastructure problem is reported in both cases but it is not as extensive as data and system quality problem. Nevertheless, failure to timely identify and overcoming these two problems (interface, infrastructure) earlier would jeopardise the effective use of SAP and lead to a greater problem of system quality. The problem of interface refers to poor input and screen design of SAP for both cases (A and B). Some of the respondents from both companies pointed out their problem with the current layout of SAP screen that is considered rigid and not user friendly. In addition to interface issue, this study also discovered infrastructure problem. The finding from case B have identified a threat of failure and slow networking infrastructure as one of major concern among end user of SAP. Apart from that, infrastructure problem found include the unavailability of suitable location for the setting up of SAP system.

One of the user expectations from the implementation of SAP system is that it should be able to provide the accurate and precise information through user-friendly format and convenient interface (Longinidis & Gotzamani 2009). However, our sand clack model suggest that although the interface problem is less in both cases, yet necessary action is needed to solve this type of usage problem once it occurred. This is because without an appropriate interface, it would lead to repeated data entry that is costly, time consuming and inevitably leading to inefficiencies which could affect the ability of the organisation to compete effectively in their market place (Trimi et al. 2005). Our sand clock model also supported previous study such as usage by Soja & Paliwoda-Pekosz (2009) that IT infrastructure is considered as one of the source problem in ERP system implementation. Our finding align with Ehie & Masden (2005) where IT infrastructure were found to be non significantly correlated to successful ERP implementation. Still, an organisation needs to urgently deal with IT infrastructure issue. This is because ERP system likes SAP cuts across several functions, including the internal operations of the company itself and its suppliers, customers, banks and others. Thus, the soundness of the entire infrastructure is necessary to facilitate complete value chain management enabled by ERP (Huang & Palvia 2001).

Timely Attention on Addressing System Quality Issues
The next classification of a sand clock model of ERP usage problem is system quality issue that comprise of (1) Functionality issue and (2) Usability issue. The functionality issue of ERP system usage as highlighted in both cases is due to the complexity of SAP features and unavailability of the SAP's required functions. Our data suggested that, due to failure of both cases to identify and address the infrastructure interface issues that have occurred earlier, therefore, they have to learn how to overcome or resolve or even suffer with their system quality issue. For example, the system functionalities problem of SAP is associated with the complexity of its features as highlighted by interviewee from case A. While, interviewee from case B believed that due to complexity of SAP system, it is unable to fulfil user expectation in simplifying work **(refer to table 5)**. Both cases, A and B had also reported the usability issue in term of inoperability and learnability of SAP. In this situation, example from both case studies highlighted problem that end user come across when they do not really understand some of the SAP task requirements. As a result from user lack of knowledge, they are unable to choose the right transactional processing function such as illustrated from examples of system problem in Engineering and Service department of case A (refer to the interview analysis).Consequently, failure to choose and use the correct functionalities in SAP would result in delay in processing the transaction in timely manner and thus, lead to inaccuracy of data entered into the system (SAP).

As the system quality problem is placed at the bottom of a sand clock model, this implies a greater problem that is derived from interface infrastructure issues. This is because system quality is regarded as one of the central dimension of IS success (DeLone & McLean 2003). According to DeLone & McLean (2003), system quality measures technical success, that is the accuracy and efficiency of IS that produces information, and information quality assesses semantic success, referring to the extent to which the information coveys the intended meaning. The system quality issue need to be addressed urgently in order to avoid unfavourable result and in a worst case scenario, the 'system failure'. As reported by Langenwalter (2000) that the failure rate percentage of ERP is estimated ranges from 40% to 60%. A major reason of the SAP (ERP) system failure results from the inefficient use by the users themselves. Although the ERP system usage is mandatory, the organisational benefits would not be achieved without the effective usage by its user (Amoako-Gyampah, K. & Salam 2004). In summation, it is important to immediately identify and address the relevant usage issue of SAP system based on the sand clock model.

CONCLUSION, LIMITATION AND FURTHER RESEARCH

This study address the research questions of "***What kinds of problems do users; operational, supervisory and managerial usually face in ERP system deployment."*** The study classified four major problems that end user encountered in ERP (SAP) system used. The classification of the usage problem is depicted through a sand clock

model of ERP usage problem. The end user usage problem is classified as data quality, system quality, interface and infrastructure.

The theoretical contribution of the paper is to gain deeper insight on the impediment of effective use of ERP. By using an inductive approach, we proposed a sand clock model to illustrate the classification of ERP usage problem during the post implementation phase. Our sand clock model suggested that data quality and system quality considered as two critical issues that need an immediate attention from the organisation. The data quality is a problematic area when users are unable to get the timely, accurate and complete data from ERP system. We urged that data quality problem is crucial and corrective action need to be taken because the incorrect data will lead to incorrect information, which will later, effect the other process in the organisation. Likewise, the system problems also need to be handled appropriately since inability of user to understand and learn this highly integrated system (SAP) will discourage the user to continue using it although the usage of ERP system is mandatory. From the practical point of view, managers would able to use a sand clock model to classify their ERP usage problem. From this classification of problem, manager would be able to use the model as a benchmark to measure the intensity and the urgency of the problems to be solved. Hence, the emphasised could be given to solve more critical problems found that significantly affected the organisation.

The research has some limitation. Since the research was conducted in two organisations in Malaysia, with a unique organisational culture and some special characteristics, the result might hold true in other organisations and environment. A similar study should be replicated using a broad and diverse sample from other countries that further extend and enhance these finding. Additionally, the sand clock model of ERP usage problem is derived from a limited number of case studies. Therefore, more research is needed to validate and extend the proposed model in this paper. More research is crucial to study the causal factors of end user problems. For instance, a longitudinal qualitative research should be carried out to investigate the relationship between the identified problems in a sand clock model with the causes of the problem. In addition, further study may also highlight the control mechanism used by the organisation in order to overcome this problem. This is because by knowing and identifying the problem alone is not sufficient to address the various problems that hinder the effective usage of ERP system. Therefore, future study could include on how managers recognise the various coping mechanism such as request for the improvement, workaround, supplement the systems or even develop a feral system.

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