Post ERP Feral System and use of 'Feral System as Coping Mechanism

Tajul Urus, S., Molla, A., and Teoh, S.Y.

Abstract—A number of studies highlighted problems related to ERP systems, yet, most of these studies focus on the problems during the project and implementation stages but not during the post-implementation use 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 users (operational, supervisory and managerial) faced in using ERP and how 'feral system' is used as the coping mechanism. The paper adopts a qualitative method and uses data collected from two cases and 26 interviews, to inductively develop a casual network model of ERP usage problem and its coping mechanism. This model classified post ERP usage problems as data quality, system quality, interface and infrastructure. The model is also categorised the different coping mechanism through use of 'feral system' inclusive of feral information system, *feral data and feral use of technology*.

Keywords—Case Studies, Coping Mechanism, Post Implementation ERP system, Usage Problem

I. INTRODUCTION

IN recent times, the post ERP implementation research especially on the usage and evaluation phase are starting to gain importance as illustrated through the increasing number of publication in this area (see [1]and [2]). Yet, the existing studies emphasize more on the evaluation of the benefits and the antecedents to ERP success. For instance, Gattiker & Goodhue [3], analysed the impact of ERP system once the system has gone live and the "shake out" phase has occurred. Others [4-5] proposed research framework to analyse the ERP system benefits or the identification of risk associated with ERP implementation during the post implementation phase [6]. Moreover, most of the post implementation ERP research takes an organisational rather than end-user perspective. Post implementation ERP studies from an end users perspective are rare. The usage problems in the post implementation stage of ERP could result in failure to achieve the promised ERP benefits [7]. Boudreau and Robey [8] 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 and instead develop some coping mechanisms.

Tajul Urus, S is with the School of Business IT and Logistics, RMIT University Melbourne, Victoria 3000 Australia (e-mail: sharina.tajulurus@rmit.edu.au)

Molla, A. is with the School of Business IT and Logistics, RMIT University Melbourne, Victoria 3000 Australia (e-mail: alemayehu.molla@rmit.edu.au)

Teoh, S.Y. is with the School of Business IT and Logistics, RMIT University Melbourne, Victoria 3000 Australia (email: sayyen.teoh@rmit.edu.au)

Therefore, it is crucial to investigate the ERP usage problem and coping mechanisms employed in order to ensure the continuance use of this highly integrated system. Thus, to explore this issue we formulated the following research questions:

"What kinds of problems do users; operational, supervisory and managerial usually face in using ERP system and how do users cope with the ERP use problem by the deployment of feral system?"

Although various mechanism could be used to overcome ERP usage problem such as request for improvement, workaround , supplement the system and even develop a 'feral system', this paper specifically look into the development of 'feral system ' as a coping strategy.

The remaining part of this paper is organised into four major sections. First, the background literature on ERP problem is presented. This section will cover the ERP usage problem and feral system conceptualisation. 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 and how 'feral system' is being used as the coping mechanism. The last section offers conclusion.

II. BACKGROUND TO THE LITERATURE

A. ERP Usage Problems

System usage has played a major role in the IS success literature l. An effective system usage is a major determinant of productivity [9]. Problems encountered by users in using ERP system will discourage them for continually using the system. Issues such as lack of trust on ERP system, resistance to changes, 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 [10].

Research on the ERP usage problem, although not extensive has identified some findings as shown in **table 1**. For instance, Topi, Lucas & Babaian [11] 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 reducing 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

the nature of difficulties experienced during ERP system adoption [12-13].

TABLE I
PROBLEMS OF ERP SYSTEM USED

Author	ERP usage	Description
Topi, Lucas & Babaian [11]	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 [13]	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 [12]	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 [14]	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.

B. Coping Mechanism

Various problems in the ERP-use process can lead users to create their own information system or workaround the system in order to accomplish their job [10, 15]. Individuals will seek out alternative when they are uncomfortable with prescribed ERP protocol[16-17]. In such situations, users might not necessarily rely on the main system (ERP) sanctioned by the organization but rather develop their own systems or database to facilitate their work- *a phenomenon known as "feral systems"*.

The review from previous literature have identified three basic concepts used to define the Post-ERP feral systems – "Feral systems", "Workaround systems" and "Shadow system". The definition of the three basic concepts is illustrated in the next table II**.** While feral, shadow and workaround systems are sometimes used interchangeably, Houghton and Kerr [10] argue that the feral systems are not similar to workaround. This is because workaround is created with the intention to bypass a recognized problem and to fix the problem temporarily [18-19]. On the contrary, feral systems are the deliberate attempts to permanently circumvent a fully functional and operationally sound system.

Nevertheless, while all feral systems can be classified as workaround systems, the reverse is not true. As such,

workaround systems become feral systems only when they are user created and their usage is outside the formal information systems. Some researchers also have reported on how 'feral system' brings the positive impact to an organisation. For example, Houghton & Kerr [10] asserted that the feral systems could be effective in sustaining management practices in ill-defined environment or in assisting the stakeholder decision-making. Also the benefits of feral systems or shadow systems encompass the provision of information and functionality which meets the needs of the individual department within the organisation [20]. The other benefits of feral or shadow systems include allowing an individual to achieve outcomes that are more positive.

TABLE II
SUMMARY OF FERAL SYSTEM CONCEPTUALISATION

Reference	Terminology	Definition
Houghton and Kerr [10]	Feral System	"An information system (computerized) that is developed by individuals or group of employees to help them with their work, but is not condoned by management nor its part of the corporation's accepted information technology infrastructure. Its development is designed to circumvent existing organizational information system".
Poelmans [18]	Workaround System	"A coping strategy that deviates from strategies that have been defined in the work flow system (WFS). End users work around the system to save the time or efforts or to avoid the limitations of the WFS."
Behrens and Sedera (2004)	Shadow System	"Systems which replicate in full or in part data and/or functionality of the legitimate system in the organization".

One notable observation from the literature is that, the concept of "system" in feral system has not always been clear. Some authors proposed feral system as 'system' or 'information system'[10, 21] , while other define it as strategy [18]. The 'system' also sometimes refers to a fully functional information system which has been created outside accepted ERP systems [10, 22] or the use of personal software like Microsoft Excel and Microsoft Access [10, 23].

C. Types of Feral Systems

The analysis from previous studies reveals three general types of feral systems *'feral information system' 'feral data'* and *'feral use of information technology'*. *Feral information system* refers to an information system or data created or used by individual or group which intend either to supplant or to supplement a formal organisational information system. Feral information systems are created as comprehensive or complete systems with many elements that are highly interrelated and interconnected. The unique characteristics of feral information systems are that they are reasonably well built, have some degree of sophistication in their functionality and provide mechanisms for inputting data, processing it and extracting output. Feral information system usually is a non-sanctioned system and operates outside an ERP system environment. An example of feral information systems reported in the literature

include Webfuse, a learning management system that provides most functionalities of commercial learning management systems [22].

The second type of feral system is *'Feral use of Information Technology'*. It refers to the use of Information Technology by end users to either supplant an ERP system function or supplement the limitations of an ERP system. For instance, this is demonstrated through Microsoft Excel used for the customisation of reporting and petty cash preparation as described above. Example from the literature includes Kerr, Houghton et al.[23] who reported how Microsoft Excel and Access are used for planning outside SAP system and how that led to little or no visibility of the plan to the organisation and its being not reflected in the corporate plan.

Feral Information System and Feral Use of IT can lead to the third type of feral system, which we refer to as *'Feral Data'*. Feral data refers to data that is stored outside the formal system (such as ERP). In the literature, it is reported that users often extract data from the formal system (ERP) and made necessary adjustment or modification in order to suit with their needs [23-24]. However, when such users fail to integrate it back into the formal system for operational, forecasting or knowledge management purposes, this can lead to the data being out of sync with formal systems and become feral data. Kerr and Houghton (2010) have discussed an example of a feral data "grass stock" which is different from the actual data reported in ERP system and which led to inaccurate forecast and business analytics output [25].

In sum, the literature review reveals three gaps in the existing study of post ERP system implementation problems. (1) Most of the previous studies tend to emphasis 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) To the author knowledge, this is the first study that specifically integrates the post ERP usage problem with a 'feral system' as the coping mechanism.

III. RESEARCH METHODOLOGY

This research utilised qualitative research approach using exploratory multiple case studies. Exploratory case study is useful for studying complex phenomenon in their natural setting and appropriate for new topic areas [26]. 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 Case B. Data were collected through face-to-face interviews with twenty-six interviewees over the 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. Table III below provides a summary of interviewees' profile.

TABLE III
SUMMARY OF INTERVIEWEE PROFILE

CASE	Department Covered	Interviewee's Job Title
A (13p)*	-Engineering and Services (ESD)	Senior Manager (1), Executive (2) (M1,E2,E3)
	- Operating Performance & Improvement (OPI)	Manager (1), Executive (1), Clerk (1) M4,E5,C6)
	- Plant Operations (PO)	Manager (1), Executive (1) (M7,E8)
	- Technical Service (TES)	Manager (1), Executive (1)Supervisor (1), (M9)
	- Human Resource Management Administration (HRMA)	Executive (1), Supervisor (E10, S11)
	-Finance and Planning (FP)	Manager (1), Executive (1) (M12,E13)
B (13 p)*	-MIS/SAP	Senior manager (1), Manager (1) , Internal Consultant (2) (M14, M15, E16,E17)
	-Finance (F)	Manager (1), Assistant manager (2) Supervisor (1) (M18,M19,M20,S21)
	-Production Planning Control (PPC)	Executive (1), Supervisor (1), Clerk (1) (E22,S23,C24)
	-Purchasing Vendor Development (PVD)	Assistant Manager (1), Clerk (1) (M25,C26)

P* -Participants

Data analysis was performed using the grounded theory method approach proposed by Strauss and Corbin [27]. 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 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 [27].

Coding is the process of identifying justificatory statements and developing conceptual categories from them. By using the open coding, categories along with their properties and dimension 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. Additionally, it is also appropriate to revise some coding categories during the analysis stage, which require us to revisit the data that that already coded.

IV. CASE STUDIES

A. 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, 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.

B. Problems and Issues in Using and Coping With ERP (SAP)

A qualitative analysis of the 26 interviews led to the identification of System, Data Quality, Interface and Infrastructure and Service Quality problems. Besides the identification of post ERP usage problem, the coping mechanism is also illustrated through use of feral information system, feral use of technology and feral data. The findings are summarised in table 4.

TABLE IV
THEMES OF POST ERP USAGE PROBLEMS AND FERAL SYSTEM QUESTION

Question	Category/ Sub Category	Supporting Data
What kind of problems do users: Operational, supervisory and managerial face in using ERP system during post implementatiom phase	**Data Quality** Untimely , Inaccuracy , Incompleteness	"Data need to be keyed in into SAP on a daily basis but as for now I am unable to do it. This is because there was no cooperation between departments." *(PPC Clerk of B)*
		Normally the amount in SAP never the same, seldom it matched, sometime we have more but sometime we have less". *(Finance Manager of B)*
		"Another problem in using SAP is in terms of the reporting itself. For example in analysing the problem cost and damage code, we need to justify the cause of damage problem. The damage code in SAP system is not so extensive. It does not really cover the entire problem. [As a result] we have to use the nearest code to the problem." *(ESD Executive of A)*.

Question	Category/ Sub Category	Supporting Data
What kinds of problems do users; operational, supervisory and managerial face in using ERP system during Post Implementation Phase?	**System Functionality** Complexity, Unavailability Employees	"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." *(HRMA executive of A)*
		"One of the SAP problems is in terms of the scheduling function, as we could not find that function from the system." *(ESD executive of case A)*
		"There are two transaction codes for us to perform our work. Users are still utilising the first code only. They do not know how to use the second code. As for me, we need to use both.*" (Finance assistant manager of case B)*
What kinds of problems do users; operational, supervisory and managerial usually face in using ERP system during Post Implementation Phase	**System Usability** Understandabilit y issue	"Our main challenge in the early stage of SAP is that we do not understand the flow. It is difficult for us when we have this problem. We are able to do the basic 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." *(PVD clerk from case B)*
		"I have to refer back to training material because this system is quite comprehensive, I would say that it is slightly complicated for user *(PO manager of case A)*
What kinds of problems do users; operational, supervisory and managerial usually face in using ERP system during Post Implementation Phase	**Infrastructure** Networking and server	"System is quite slow; it 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 if the server hang or system become too slow. In my opinion, our problem lies on the server itself*." (PVD assistant manager of case B)*
How do users cope with the ERP use problem by the	**Feral System** Feral Information System,	"Invoice Tracking System is used to monitor outstanding payments to vendors. So, whenever, there are invoices yet to be approved,

Question	Category/ Sub Category	Supporting Data
deployment of feral system?	Feral use of Technology	we put them there. There is a similar function in SAP for tracking invoices." *(FP executive of case A)*
		"When I came here, I thought that everybody is using the SAP bank reconciliation which is one of the functions in Accounts Payable. In SAP, the bank reconciliation function reads from the tape and runs the bank reconciliation but this is not the case in A. We prepare the bank reconciliation online. I was very surprised at first. When I came here, the practice is already like that. It is because of the previous user, the people before us." **(FP executive of case A)**
		"We use excel to monitor the supplier status. Yes, we can use SAP for that purpose but we need to go through various report but in excel, I use color code (from the excel template) to make it easier to identify [...]. From what I know, the creditors ageing from the system do not provide me with detail analysis. For example, what is the actual problem with the specific Purchase Order or why it is hanged?" *(a PVD clerk of case B)*
How do users cope with the ERP use problem by the deployment of feral system?	**Feral System** Feral Use of Technology	"You cannot generate report from SAP. The SAP purpose is mainly to key in the data and attach the report, so that other people could use it for future reference. You can just click this button (in excel) to know the history, let's say, for the equipment failure and then, you key-in into the SAP [...]. SAP is a system where you can gather all the information that you have and store in one particular system. However, detail reports need to be done separately, in Excel or others." *(ESD executive of case A)*
How do users cope with the ERP use problem by the deployment of feral system?	**Feral System** Feral Use of Technology	"I try to reduce the duplication of my work. It is quite difficult since I need to prepare in excel, then I need to compile the SAP report and check whether it is the same or not. What I meant with the duplication is referred to the redundancy of the work. Like, for Petty Cash claim, when I receive the claim from our staff, I need to post it into excel immediately. I do not need to compile it until end of the month. Then, I need to check petty cash from excel whether it tale with the system (SAP)." *(Assistant manager of Finance in case B)*

V. DISCUSSION

A. SAP Usage Issues

Users in both companies (A and B) faced a number of problems pertaining to data quality, system, interface and infrastructure. The data quality issue found are **untimely, inaccuracy and incompleteness** of SAP data. Most of the data quality problem found in this study is associated with the untimely of data. As such, data recorded in SAP is outdated due to delay in transactional processing. For instance, delay in data entry by the receiving unit of PPC department in case B resulted on the discrepancies between the recorded data of SAP and the actual inventory. In the other example, data quality problem is associated with inaccuracy issue. Previous studies have also highlighted data quality problems related to accuracy [28-29].

The incompleteness of data in case A is reported in the Engineering and Service department (ESD) during the identification of the root cause of the Plant's problem. The incompleteness of data problem has also been reported in case B during the computation of taxation figures. In this example, the finance supervisor of B was unable to retrieve all the information that she entered into the system. Our finding is aligned with Nelson, Todd & Wixom [30] that suggested the information quality measures includes currency (timely), accuracy, completeness. The finding from this study also supports previous research, for example Lin [14] argued that if the information provided by ERP system is up to date (timely), accurate, complete and well formatted, a faster task performance and employee productivity can be achieved.

According to Langenwalter [31], the failure rate percentage of ERP is estimated to range between 40% to 60%. A major reason of the SAP (ERP) system failure s associated with the inefficient use of the system by users. Although the ERP system usage is mandatory, the organisational benefits would not be achieved without effective usage [32]. Thus, the system quality problem is identified as one of the reasons that hinder the effective use of ERP system.

ERP systems are traditionally regarded as being complex to learn and use. Usability problems can hamper the extent to which a system can be used by its users to achieve a set of goals within a specified context of use [33]. Both cases, A and B reported the usability issue in terms of operability and learnability of SAP. 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.

Besides the system quality problem, another reported problem is on SAP interface. One of the user expectation from the implementation of SAP system is that it should be able to

provide accurate and precise information through user friendly format and convenient interface [34]. Shneiderman's proposed eight golden rules for user interface design are (1) strive for consistency (2) cater to universal usability (3) offer informative feedback (4)design dialogs to yield closure (5) prevent errors (6) permit easy reversal of actions (7) support internal locus of control and (8) reduce short-term memory load [33, 35]. However, interface problems highlighted in cases A and B signify poor input and screen design of SAP. Respondents from both companies underline their problem with the current layout of SAP screen that is not user friendly.

Finally, the post ERP usage problem is associated with infrastructure. Infrastructure refers to the IT infrastructure (such as hardware, software, server and networking capacity) and physical infrastructure for SAP set up. Based on Huang & Palvia [36], infrastructure including both basic and IT infrastructure, constitutes the basic prerequisite for ERP implementation. ERP cuts across several functions, including the internal operations of the company itself and its suppliers, customers, banks, others. The soundness of the entire infrastructure is necessary to facilitate complete value chain management enabled by ERP[36]. The case studies have identified threat of failure and slow networking infrastructure as one of major concern. This situation is especially pertained to case B.

B. Feral System as Coping Mechanism

In solving the SAP usage problem discussed earlier, users in both companies (A and B) have employed 'feral system' as the coping mechanism. There are two types of feral system used; feral information system and feral use of technology. For instance, the creation of invoice tracking system in case A and bank reconciliation in both cases indicates the user ways to cope with the complexity issue in SAP. Bank Reconciliation is created since users are not familiar with the similar function from SAP. In case B an invoice tracking system is developed with the intention to duplicate the similar function from SAP.

The interrelationship between the SAP usage problems and use of the feral information system as the coping mechanism is shown below:

- Complexity (1a) → Feral Information System (Bank Reconciliation, A)
- Complexity (1a) → Feral Information System (Invoice Tracking System, A)

Beside feral information system, SAP users have employed 'feral *use of technology*' to overcome their ERP usage problem (unavailability, inoperability and learnability issue). For example, the unavailability of scheduling and planning function in SAP results in the adoption of Microsoft Project in case A. Microsoft excel is used extensively in both cases to overcome the SAP issues of customised report. In addition, Excel is also used in the finance areas such as preparation of petty cash, journal voucher creditors aging in both cases. Overall, the interrelationship is shown as follow:

- Unavailability (1a) → Feral Information System (MS Project for scheduling, Excel reporting ,B)
- Operability Problem (1a) → Feral Information System (MS Project, MS Excel, B)

Excel is also used to overcome some of the data quality problem. For example, in case B where the creditors aging are prepared using spread sheet to overcome data incompleteness problem. This is because in SAP some of the figures required in the creditors aging report is not being fully captured in the system (SAP). In the other example, the cashbook is also prepared in Excel since SAP cashbook is unable to provide the accurate carried forward for bank account in case B. This suggested the accuracy problem which led to user using feral use of technology.

- Data Accuracy (2a) → Feral Information System (MS Excel for cashbook, B)
- Data Incompleteness (2c) → Feral Information System (MS Excel for creditors aging, B)

The following figure 1 illustrates a model of SAP (ERP) Usage Problem and Feral System as Coping Mechanism. This model show the interrelationship between the problem encountered by user in using SAP system for both cases and how they overcome it by using feral information system or feral use of technology, which is part of feral system.
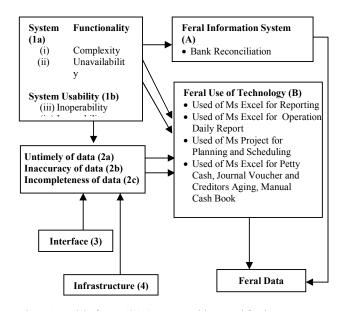

Fig. 1 A model of ERP (SAP) usage problems and feral system as coping mechanism

VI. CONCLUSION, LIMITATION AND FUTURE RESEARCH

This study address the research questions of "*What kinds of problems do users; operational, supervisory and managerial usually face in using ERP system and how do users cope with the ERP use problem by the deployment of feral system?* This

paper adopts a qualitative method and employs the grounded theory approach to data analysis.

Two case studies are employed where data were collected from twenty six interviews. The study identified four major problems that end users encountered in ERP (SAP) system use which comprised of data quality, system quality, interface and infrastructure. Further a number of feral systems are employed to cope with usage problems.

The data quality is a problematic area when users are unable to get the timely, accurate and complete data from ERP system. Data quality problem is crucial and corrective action needs to be taken because the incorrect data will lead to incorrect information, which will later, affect other processes in the organisation. The problem with data quality issue need to be addressed since neglecting the importance of data management will later cause additional resources in correcting data error [28].

Delay in overcoming the data quality 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 [37]. According to Xu et al [37], an integrated ERP systems like SAP require less time to gather useful information. The information only needs to be entered into the system once and then it is available throughout the system in a consistent manner. Yet, the existing problems of data quality make the SAP implementation objective become impossible.

Attention also need to be given by organisations to urgently address other issues such as system, interface and infrastructure in order to avoid unfavourable result and in a worst case scenario, the 'system failure'. The system problems need to be handled appropriately since inability of user to understand and learn SAP will discourage the user to continue using it although the usage of ERP system is mandatory.

From the practical point of view, this paper could assist managers in reaching the sources of problems encountered by the end-user. Thus, the paper facilitates overcoming these problems. Managers as well as other practitioners should anticipate possible problem and assess the potential threat to their respective project. Knowing and identifying the problem alone is not sufficient to address the various problems that hinder the effective usage of ERP system. Therefore, the practical implication of this paper would also 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. In a way, this paper could facilitate managers to recognise the 'feral system phenomenon' that might influence the use of ERP system in the organisation either in a positive or negative manner.

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 not hold true in other organisations and environment. A similar study should be conducted using a broad and diverse sample from other countries to further extend and enhance these findings.

Additionally, the model of ERP usage problem and feral system is derived from a limited number of case studies. Therefore, more research is needed to validate and extend the proposed model. 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 with the causes of the problem.

In addition, further study may also highlight the other nature of 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 besides feral system.

REFERENCES

[1] Esteves, J. and V. Bohorquez (2007) *An Updated ERP Systems Annotated Bibliography: 2001-2005*. IE Working Paper.
[2] Moon, Y.B., *Enterprise Resource Planning (ERP): a review of the literature*. International Journal Management and Enterprise Development, 2007. **4**(3): p. 235- 264.
[3] Gattiker, T.F. and D.L. Goodhue, *What Happen After ERP Implementation: Understanding the Impact of Interdependence and Differentiation on Plant -Level Outcomes*. MIS Quarterly, 2005. **29**(3): p. 559-585.
[4] Shang, S. and P.B. Seddon, *A comprehensive framework for assessing and managing the benefits of enterprise systems: the business manager's perspective*. Information Systems Journal, 2002. **12** (4): p. 271–299.
[5] Esteves, J. *Addressing the justification of Enterprise System Benefits: A Desires and Expectancy Disconfirmation Model*. in *American Conference of Information Systems (AMCIS)*. 2005.
[6] Peng, G.C. and M.B. Nunes, *Identification and assessment of risks associated with ERP post-implementation in China*. Journal of Enterprise Information Management, 2009. **22**(5): p. 587 - 614.
[7] Yu, C.-S., *Causes influencing the effectiveness of the post-implementation ERP system* Industrial Management & Data Systems 2005. **Volume 105,**(Number 1): p. pp. 115-132.
[8] Boudreau, M.-C. and D. Robey, *Enacting Integrated Information Technology: A Human Agency Perspective*. Organization Science, 2005. **16**(1): p. 3-18.
[9] DeLone, W.H. and E.R. McLean, *DeLone and McLean model of information systems success: A ten-year update*. JOURNAL OF MANAGEMENT INFORMATION SYSTEMS, 2003. **19**(4): p. 9-30.
[10] Houghton, L. and D. Kerr, *A study into the creation of feral information systems as a response to an ERP implementation within the supply chain of a large government-owned corporation*. Int .J. Internet and Enterprise Management, 2006. **4**(2).
[11] Topi, H., W. Lucas, and T. Babaian. *Identifying Usability Issuse With An ERP Implementation*. in *ICEIS 2005 - HUMAN-COMPUTER INTERACTION*. 2005.
[12] Elbertsen, L., J. Benders, and E. Nijssen, *ERP use: exclusive or complemented?* Industrial Management & Data Systems, 2006. **106**(6): p. 811-824.
[13] Soja, P. and G. Paliwoda-Pekosz, *What are the real problems in enterprise system adoption?* Industrial Management & Data Systems, 2009. **109**(5): p. 610-627.
[14] Lin, H.-F., *An investigation into the effects of IS quality and top management support on ERP system usage*. Total Quality Management & Business Excellence, 2010. **21**(3): p. 335 - 349.
[15] Jones, D., et al. *The Rise and Fall of Shadow System: Lesson For Enterprise System Implementation*. in *Association for Information Systems (ACIS 2004)*. 2004.
[16] Oreg, S., *Resistance to change: Developing an individual differences measure*. Journal of Applied Psychology, 2003. **88**(4): p. 680–697.
[17] Dougherty, D., *Re-imagining the differentiation and integration of work for sustained product innovation*. Organization Science, 2001. **12**(5): p. 612–631.
[18] Poelmans, S., *Workarounds and Distributed Viscosity in Workflow System: A Case Study*, in *SIGGGROUP Bulletin*. 1999. p. 11-12.

[19] Koopman, P. and R.R. Hoffman, *Work-arounds, Make-work and Kludges.* Human Centered Computing, 2003.

[20] Behrens, S. and W. Sedera, *Why Shadow Systems Exist after an ERP Implementation*, in *8th Pacific Asia Conference on Information Systems* 2004: Shanghai. p. 1713-1726.

[21] Behrens, S. and W. Sedera. *Why Do Shadow Systems Exists after an ERP implementation? Lesson From a Case Study.* in *Association for Information System* 2004.

[22] Behrens, S., *Shadow Systems: The Good, The Bad and The Ugly.* Communication of the ACM, 2009. **52**(2): p. 124-129.

[23] Kerr, D., L. Houghton, and K. Burgess, *Power Relationship that lead to the development of Feral Systems.* Australasian Journal of Information Systems, 2007. **14**(2): p. 141-152.

[24] Kerr, D. and L. Houghton, *Feral Systems: The likely Effect on Business Analytics Functions in an Enterprise Resource Planning System Environment*, in *19th Australasian Conference on Information Systems*. 2008: Christchurch, New Zealand.

[25] Kerr, D. and L. Houghton, *Just In Time or Just in Case: A Case Study on the Impact of Context in ERP Implementation* Australasian Journal of Information Systems, 2010. **16**(2).

[26] Eisenhardt, K.M., *Building Theories from Case Study Research.* Academy o/Management Review 1989. **14**(4): p. 532-550.

[27] Strauss, A. and J. Corbin, eds. *Basics of Qualitative Research: Technique and Procedures Developing Grounded Theory*. Second ed. 1998, SAGE Publications Ltd: California.

[28] Haug, A., J.S. Arlbjørn, and A. Pedersen, *A classification model of ERP system data quality.* Industrial Management & Data Systems, 2009. **109**(8): p. 1053-1068.

[29] Wand, Y. and R.Y. Wang, *Anchoring data quality dimensions in ontological foundations.* Commun. ACM, 1996. **39**(11): p. 86-95.

[30] Nelson, R.R., P.A. Todd, and B.H. Wixom, *Antecedents of Information and System Quality: An Empirical Examination Within the Context of Data Warehousing.* Journal of Management Information Systems 2005. **21**(4): p. 199 - 235.

[31] Langenwalter, G.A., ed. *Enterprise Resource Planning and Beyond—Integrating Your Entire Organization*. 2000, St. Lucie Press: Boca Raton.

[32] Amoako-Gyampah, K. and A.F. Salam, *An Extension of the Technology Acceptance Model in an ERP implementation Environment.* Information and Management, 2004. **41**(6): p. 731-745.

[33] Singh, A. and J. Wesson. *Evaluation Criteria for Assessing the Usability of ERP Systems*. in *Proceedings of the 2009 Annual Research Conference of the South African Institute of Computer Scientists and Information Technologists*. 2009. Riverside Hotel and Conference Centre, Vaal River.

[34] Longinidis, P. and K. Gotzamani, *ERP user satisfaction issues: insights from a Greek industrial giant.* Industrial Management & Data Systems 2009. **109**(5): p. 628 - 645.

[35] Shneiderman, B., ed. *Designing the user interface: strategies for effective human-computer interaction*. . 3rd ed. 1998, Addison Wesley Longman Inc.

[36] Huang, Z. and P. Palvia, *ERP Implementation issues in advanced and developing countries.* Business Process Management, 2001. **7**(3): p. 276-284.

[37] Xu, H., et al., *Data quality issues in implementing an ERP.* Industrial Management & Data Systems, 2002. **102**(1): p. 47-58.

Sharina Tajul Urus is a senior lecturer at Universiti Teknologi Mara, Shah Alam Malaysia. She currently is a full time PhD student at School of Business IT and Logistics, RMIT University, Melbourne. She completed her Master in Accounting from Curtin University of Technology and her BA (Hons) Accounting & Finance from De Montfort University, Leicester, UK. Her research interests include Enterprise Resource Planning and Feral system.

Alemayehu Molla is an Associate Professor, School of Business IT and Logistics, RMIT University. He researches in the areas of Green IT and digital business. He has published more than 90 articles including in the European Journal of Information Systems, Information & Management, International Journal of E-commerce, Journal of E-commerce Research, and Journal of E-commerce in Organizations and The Information Society Journal.

Say Yen Teoh is a lecturer of Business IT and Logistics in the RMIT University, Australia. Her primary research interest is to explore the effective and efficient use ERP. Besides publishing extensively in journals, book chapters and international conferences, she also served as ERP track chair in several international conferences.