Decision-making to switch your ERP system: empirical Japanese evidence

Tingting Huang

Graduate School of Economics and Management, Tohoku University
1-27 kawauchi, Aoba-ku, Sendai City, Miyagi Prefecture, 980-8576
Japan
www.shortbio.org/yoruhuang@gmail.com

Abstract:

A huge research gap in ERP life cycle, the Decline stage, remains. Not only limited empirical evidence is found to support the Decline stage, but also, the existence of this stage is not acknowledged by the majority. On the other hand, because that the Decline stage is short of theory and data support, organizations which are or will be at this stage have little help to deal with what might happen. This research aims at proposing a practical decision model for organizations facing ERP (Enterprise Resource Planning) switching/reversion. The process model of Rasmussen's Cognitive Control of Decision Processes was adopted as the theory lens to construct the decision model. Based on the survey results from eighteen organizations, a descriptive model - A2O model - is proposed. This research fulfills the blank in the ERP life cycle, provides the empirical supports on exploring the critical issues, and enlightens vendors and consultants on product development and customer service.

1. Introduction

The roots of Enterprise Resource Planning (ERP) systems may go back to half a century ago. With the development of information technology (IT) and the demands of organizations, ERP which originated from manufacturing cores had covered nearly all essential processes and functions of organizations two decades ago. As one of the most rapidly spreading terms, ERP has gotten various definitions in which three common factors - integration, packages, and best practices - are usually included [1]. The whole ERP software market has experienced rapid growth since the 1990s. Although some shifts happened during these years, according to Columbus [2], in spite of the worldwide ERP software market share in 2012 shows that the SAP is still leading the worldwide market with 24.6% market share, new ERP vendors with tremendous growth indeed pose a potential threat. Meantime, the worldwide ERP market experienced slow growth of 2.2%, yet quoted from Columbus [2] "Software-as-a-Service (SaaS), financial management and Human Capital Management (HCM) applications showed potential for breakout growth." The ERP report of Panorama Consulting Solutions [3] pointed out that the traditional ERP software was chosen by the majority of 61% with an increase of 3% over 2012 and 26% of respondents selected software as a SaaS and cloud ERP. The modern trends in ERP are also concluded by scholars. Powell et al. [4] identify ten key trends, such as Customizable ERP, Collaborative ERP, SaaS and Cloud Computing, Web-enabled ERP, Mobile ERP, and Real-time ERP, etc. To put it bluntly, traditional ERP in organizations, such as on-Premise ERP, has already been increasingly impacted by emerging information technology, such as cloud services and social media technologies. A recent survey conducted by Gartner group in 2013 reveals that 47% of the organizations planned to move to cloud-based systems within the next five years [5]. They also made some ERP predictions in 2014 [6] to highlight that a shift towards SaaS model to be unstoppable.

In general, ERP implementation project contains three major phases - the pre-implementation phase, the implementation phase, and the post-implementation phase. The post-implementation phase, in which ERP system is operating in the organization, can be divided into four stages: the Diffusion stage, the Utilization stage, the Enhancement stage, and the Decline stage [7]. In the previous studies, the post-implementation phase had been identified but very little attention had been paid on the real return on investment of such big projects [8]. Problems associated with ERP implementations become more rampant during the post-implementation phase [9]. As Chang [10] pointed out, the ongoing management and support of the ERP system remain a challenge beyond "go live". However, almost every scholar that studied the literature of ERP along with the ERP Life Cycle has stressed the fact that there is no research in the last stage of ERP Life Cycle. There may be two reasons lead to this result. First, there are not enough organizations that reach this stage. As a matter of fact, in a recent research, Huang [11] can only find forty organizations experienced ERP switching out of 869 cases. It is hard to get the data since organizations tend to deny any negative information about them. There is also no standard for estimation. Second, there are bigger issues in other stages. Admittedly, the Implementation phase has been the center of worldwide researchers' attention since two decades ago. As many researchers stressed repeatedly, the post-Implementation phase, the longest period, is considered to accompany the organization for more than twenty years. It is impossible that the issues in this phase are less or less important than other phases.

Hence, a huge research gap in ERP life cycle, the ending stage, remains. Not only limited empirical evidence is found to support the Decline stage, but also, the existence of this stage is not acknowledged by the majority. On the other hand, because that the Decline stage is short of theory support and data support, organizations which are or will be at this stage have little help to deal with what might happen. Hence, during the Decline stage of ERP Life Cycle, organizations will face one big issue about how to deal with the current system. Nevertheless, as the most important event in the Decline stage of ERP Life Cycle - making decisions on switching the ERP system, there is no research as well. In ERP field, most studies focus on the decision-making of ERP system selection [12, 13] for the first time. It is considered that there are strong linkages between ERP selection and ERP success [14]. However, after the first ERP system implemented in organizations, there will be another important key decision-making point which usually occurs in the Decline stage. Based on the findings of Huang [11], there are two considerable choices, Life extension and Decommission. The first one means organizations will try to prolong the life of current systems. The other one presents for abandoning the existing system. The previous decision models cannot be adopted directly, and no decision model is

proposed for this particular event. In this regard, it is worth efforts to focus on the transformation that both ERP software and the organizations are going to go through it. As long as we focus on the Decline stage, the following question should be solved eventually.

RQ1: How to make decisions on switching ERP system during the Decline stage?

Contributions of this research consist of fulfilling the blank of ERP life cycle theory, exploring the critical issues in the Decline stage, revealing the reality of ERP switching/reversion, providing a practical decision model for organizations, and building the foundation for researchers interested in this period. As an extended study of Huang [11], this research is able to explore the above shifting period in organizations empirically by conducting a survey within the organizations that have experienced the Life extension or Decommission, and build tool for decision-making in the Decline stage in order to prepare and assist organizations in advance.

The remainder of the paper is organized as follows: Section 2 presents the related background literature, followed by the research methodology in section 3. Section 4 includes the results of the survey. In section 5, the proposed decision-making model is explained in detail. In section 6, a discussion of the research findings and implications is provided. Finally, a conclusion is presented in section 6.

2. Background

2.1. Decline stage of ERP Life Cycle

Over the last decade, research referred to ERP Life Cycle has been in full flourish. The dominant research method of ERP Life Cycle is process model deduction. Usually, there are three ways to construct the process model of ERP Life Cycle. The first one is deducting from the traditional Systems Development Life Cycle (SDLC) model since ERP system is one of the information systems (IS). The second way is modifying previous ERP Life Cycle models. The third way is analyzing empirical data from case study or survey to build the process model. Apparently, the last way is used frequently by vendors and consulting companies and the others are more common in the academy. In general, the traditional ERP life cycle model covers the pre-implementation phase, the implementation phase, and the post-implementation phase. Although most research efforts are still focusing on the implementation phase [53, 54, 58], we can see that the study on the post-implementation phase [54, 55, 56, 57] is increasing these years. In order to give the longest period - the post-implementation phase - the attention it deserves, a conceptual model of ERP Life Cycle [7] from go-live to withdrawal is proposed to specify the post-implementation phase. The Diffusion stage starts at the go-live point, which means the staffs can recognize and use the ERP system through their computers and ends at the Stabilization point. The Utilization stage is expected to begin once the performance reaches its first steady state. Staffs can use the ERP system as any other usual software. The Enhancement stage is accompanied by the first reform action. People are familiar with the ERP system and try to explore more value. The Decline stage will happen when the performance of the current system cannot reach a higher level; it starts at the turning point and ends at the withdrawal point. Huang and Yasuda [15] have conducted a comprehensive literature review related to the models of ERP Life Cycle, in which twenty-six models are accumulated and discussed. Among the twenty-six original models, there are even two models [16, 17] that do not cover the post-implementation phase. Comparatively, there are only four out of twenty-six original ERP models that contented the Decline stage. Esteves and Pastor [18] make some conjectures in the Decline stage. They point out that although most organizations were in or just after the implementation stage, there are cases that ERP systems had been abandoned or replaced for some reasons. Regretfully, they could not find any published data during the survey of literature review in 2001 and 2007. Ahituv et al. [19] compare the step of system termination to the termination activity of the traditional SDLC and stress that it is more complex and difficult to replace ERP system than normal applications. As a practitioner, Klee [20] makes his points through four keywords. They are ability, business, technology, and cost. When the current ERP system becomes old with a bad solution and costly, new business requirements are rising, and new technologies are emerging, there is no reason to not join the new life cycle of new ERP system. Bento and Costa [21] also discuss and agree on above opinions. Additionally, the descriptions of the

Decline stage in previous research are very poor without any empirical evidence, and the critical issues at this stage are only based on speculations.

In fact, the Decline stage is an essential stage and the mutual stage of ERP system both in success and failure. When the ERP no longer responds to the organizations' new demands as well as the appearance of new technologies or the inadequacy of the ERP system [18, 19, 21], the performance drops quickly; the needs of organizations cannot be satisfied although the system itself has little errors. The users will begin to complain about the system, and new arrangement will be scheduled gradually. Upgrading is now nearly as costly as implementing a new ERP solution [20, 21], the current system will be reformed completely at the end which can be recognized as the Withdrawal point. However, the high costs inherent in the updating ERP's process is certainly also an opportunity to evaluate other vendors and other technologies [21]. The support from the third party increases and the consultants' support will be more important if facing changing vendors. When the organization cannot recognize this variation, this stage may be last long, and causes unexpected loss; when the organization already has a reform plan, this phase will be the period of preparing for the next ERP system. DeLone and McLean [22] pointed out that IS success is a multidimensional and interdependent construct. Many scholars such as Markus and Tanis [23] and Ross and Vitale [24], tried to explore the success metrics or to define the obstacles to success. On the contrary, IS failure is considered to be another angle to understand the IS system. Lyytinen and Hirschheim [25] defined four types of failure; they were Correspondence Failure, Process Failure, Interaction Failure, and Expectation Failure. Again, the term of IS success/failure can be ambiguous as well. The IS success/failure may mean the IS implementation project success/failure, the IS post-implementation success/failure, the IS project success/failure, etc. In this research, the success/failure of ERP presents the post-implementation success/failure in organizations in the period from go-live to withdrawal. As a matter of fact, to verify an ERP system's success/failure, a specific period is indispensable. During the ERP Life Cycle, the common scenario is that not all the four stages will happen. For instants, when the utilization stage is estimated to be a success, keeping the success seems to be the right way to choose; whether the enhancement activities are done or not, the decline stage will definitely come. When the failure is the result, there are two choices. One is to replace the current system with a new system or to abandon it directly. The other is to solve the problem to achieve success again. In the first scenario, the existing of the decline stage is confirmed by the failure result. In the second scenario, the above same things happen.

Comparatively, there were few studies referred to the Decline stage. Haddara and Elragal [26] conclude many reasons of early ERP retirement when the ERP adaptation goes wrong. However, the answer is insufficient through a single case study. Nicolaou and Bhattacharya [27] classify decommission into two categories - switches and abandonment. They think late switches and abandonment represent the worst-case scenario and conclude both early and late abandonments lead to apparent differential performance deterioration. You et al. [28] also consider abandon as an option when the project goes badly from the financial perspective. Apparently, the financial possibility of pursuing new IS has not been considered or hard to be evaluated yet. Instead of replacing with a new system, major enhancement or upgrade is another option. Holland et al. [29] predict organizations may need other 'beyond ERP systems' to capture information about competitors, customers, and suppliers. Some similar conceptual frameworks for next generation of ERP system can be found in prior literature which is usually called as ERP II or ERP III. Frank [30] introduces a method to migrate from a traditional ERP system to a distributed modular ERP system. Similarly, life extension of current ERP system - a third way to deal with the declining system - refers to adopt any possible method to extend the lifespan of the current information system. Nicolaou and Bhattacharya [27] analyze the 'late' enhancements in ERP-adopted organizations. Although 'Late' here only refers to a relatively long post-implementation period after the go-live of ERP system, they did conclude that late enhancements have an overall negative impact on ERP-enabled firm performance. Although the existence of the Decline stage has already been proved [11] - forty organizations in Japan have switched or upgrade majorly their ERP systems, current research is more focus on the potential risk or benefit of switching to a new system, but less focus on when to make a decision and how.

2.2. Decision theory

It comes to no doubts, that decision-making is a typical human activity. However, the roots of classical decision-making conception may go back to the economy and mathematics [31-33]. Based on the principle of optimization developed by mathematician and pioneer of modern computer science John von Neumann and economist Oskar Morgenstern in the book Game theory and economic behavior, classical decision theories boomed as an important psychological subject since the 1950s [31, 33]. Polič [33] quoted the research of Collyer and Malecki (1998) to distinguish three periods of the development of decision-making theory: Rational decision-making models, Descriptive models, and Decision models in natural settings. Rational decision-making theory began from 1955 to 1975. Classical decision theory tended to focus on the decision event, which was "choosing from among a fixed set of known alternatives based on stable" [34]. As classical decision theory, such as Subjective Expected Utility (SEU), rational decision theory is a normative decision theory which means a theory about how decisions should be made in order to rational [35]. Theoretically, all consequences should be considered before decision-making for optimized decision. Since people are not like computers, the stress on abstract rationality and the neglect of complexity caused the failure of classical decision theory [33]. During the period between 1965 and 1985, the descriptive theory - a theory about how decisions are actually made [35], also known as behavioral decision theory, rose with Herbert Simon's influential concept of bounded rationality. He thought that people will not be able to estimate all the possible values; instead, they choose the first satisfied one. Naturalistic decision making, a dominating field in psychology, was starting in the 1980s. It stemmed from the awareness that daily decision-making activities cannot be simulated in fixed conditions of a laboratory. Natural settings involve more people, more uncertain dynamic environment, more goals, time stress, and high stakes as well, which means that the aim is not making a decision but achieving a broader goal [34]. Many influential models of naturalistic decision-making [32] emerged, such as Noble's Situation Assessment model, Klein's Recognition-Primed Decisions model, Beach and Mitchell's Image Theory, Rasmussen's The Cognitive Control of Decision Processes, etc. Polič [33] also referred the concept of macro cognition which the field of naturalistic decision making and related concepts during the last years.

In this research, the process model of Rasmussen's Cognitive Control of Decision Processes [36] was adopted as the theory lens to construct the decision model for the organizations to switch the current ERP system. The reason is that this model is for the decision-making processes of human operators of complex systems [32], which is a tool for reliable prediction of human performance [36]. Since the decision-making of switching ERP system involves people familiar with information systems, and to predict and refine the decision process is the main purpose of this research. There are three critical concepts in this model: Skill-based behavior, rule-based behavior, and knowledge-based behavior. Rasmussen distinguishes between those three types of behavior that are controlled by qualitatively different cognitive mechanisms through extensive analysis of actual accidents and think-aloud protocols obtained by means of simulators [32]. According to Rasmussen's theory, the skill-based behavior occurs without conscious control, which follows an automated, smooth statement of an intention; the rule-based behavior follows the certain rules and know-how; and the knowledge-based behavior requires deeper understanding of the nature of the situation and explicit consideration of objectives and options, whereas skill-based and rule-based behaviors characteristic of expertise and familiarity with the situation. The skill-based, rule-based, and knowledge-based behaviors allow very detailed analysis of decision-making activities in particular events or situations. This theory will be used to organize and simplify the major activities during the decision-making event.

3. Methodology

A questionnaire survey was adopted by this research. The online questionnaire survey was sent by email or message broad on the official website at first. Then, two reminders were sent through telephone and email every two weeks. The survey period is five weeks from October to November in 2016. The research sample contains thirty-eight organizations which have experienced ERP switching/reversion [11]. The source of secondary data is the files of case studies provided by ERP vendors. The case studies conducted by Japanese vendors are interviews with CEOs and IS/IT managers in those organizations. The contents of each case study generally insist of organization's information, status

before and after the ERP switching, the aims and requirements of organizations, the specific process of implementation, and the information of the selected ERP product. The questions are designed mainly in the form of the 5-point Likert rating scale, single textbox, and ranking. The aim of this survey is to explore the reality of organizations in the Decline stage and to form a practical process decision model. Based on the secondary data [11], four major parts of the questionnaire are set up (Figure 1). By accumulating important items of all thirty-eight case studies about the ERP switch/reversion project, the questionnaire insists of the basic information of organizations, the information of the project, the preparations for the decision-making, and the decision-making period. 'The Basic information' contains the information of responders and their organizations. 'The Experienced ERP projects' contains the information of the last ERP implementation project. 'The Preparations for decision-making' contains what organizations did when they prepared for the decision-making. Finally, the Decision-making period' contains the reasons and issues that organizations have faced and the common procedure of conducting a decision-making.

Data from the Basic information section and the Experienced ERP projects section can be analyzed for learning the difference between SMEs and Large Enterprises (LEs) or various businesses when facing ERP switching/reversion. Questions in these two sections are in the form of a single textbox. In the Preparations for decision-making section, the major purports are to find the tendency of the decision-making group selection, evaluation both in system and management before the decision, goals of the decision-making, strategy of decision-making, and the assessment of each potential decision. The 5-point Likert rating scale is adopted in this section. The section of Decision-making period is set for identifying the specific detail of the decision-making in organizations, such as the reasons, the critical issues, and the procedures. Questions in this section are in the form of the rating scale and ranking. The secondary data is complementary to the survey data. It provides detailed information and exploration narratively for each survey item, such as what has been done during the planning and project period, what are the causes and outcomes of a certain issue, etc.
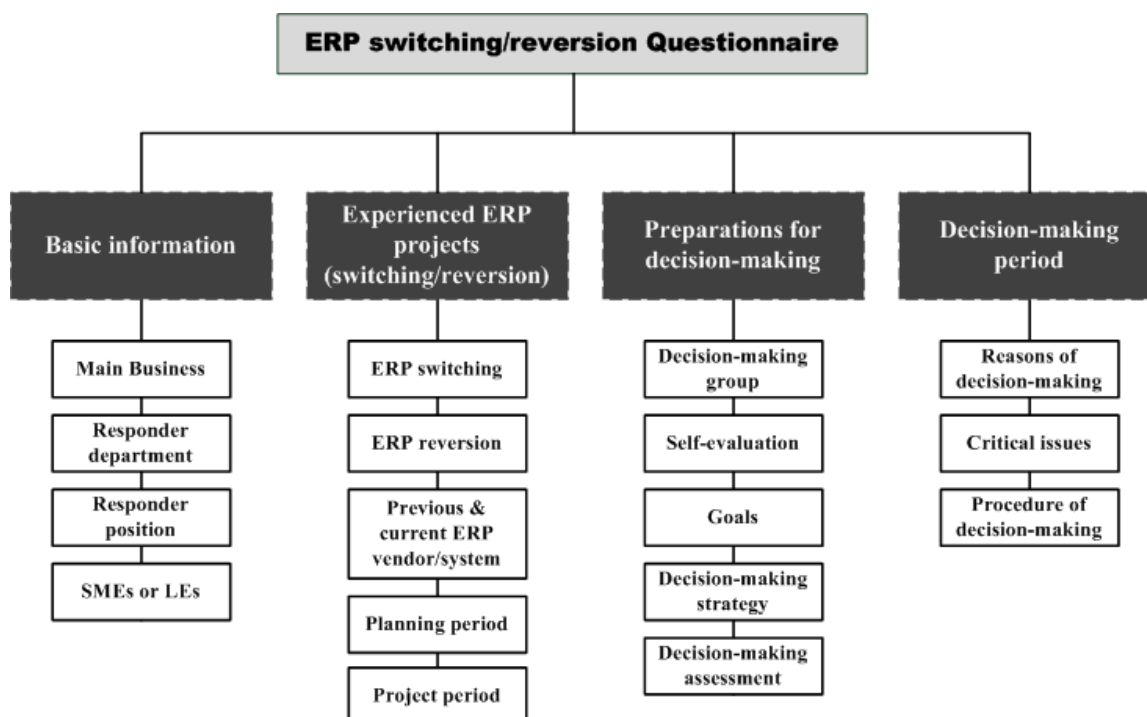

Fig. 1. ERP switching/reversion questionnaire.

4. Results

In the end, eighteen responses were accumulated through the online survey tool, in which sixteen responses were complete and usable (one response misses the answers of the forth section). The response rate is 42%.

4.1. Basic information

Eleven out of sixteen organizations belong to the manufacturing industry, and other five organizations have various businesses in the service industry. Ten organizations are LEs, and other six are SMEs. Six responders come from the IS department, others belong to the Management department, Production Division, Business department, Sales department, Accounting department, etc. Within all the responders, nine responders declared their positions are all at the management level.

4.2. Experienced ERP projects

One organization (SMEs) only experienced major ERP reversion. Eleven organizations (three SMEs and eight LEs) only experienced ERP switching. Four organizations (two SMEs and two LEs) experienced both ERP switching and reversion. Half of the sixteen organizations adopted the foreign ERP package at the first time; however, in the second time, the domestic ERP packages are more popular, and only two organizations chose to switch to the foreign ERP package. The average planning period is nearly eight months, and the average project period for ERP switching and reversion is twelve months and eight months. Additionally, there is a small difference between SMEs and LEs related to the planning and project period. For LEs, the average planning period and project period are seven months (two to eighteen) and thirteen months (three to twenty-seven). For SMEs, the average planning period and project period are nearly nine months (zero to twenty) and ten months (six to thirteen). As we can see, the planning period of SMEs and the project period of LEs distribute more dispersed.

4.3. Preparations for decision-making

Preparations for decision-making usually occur during the planning period. Five major activates can be concluded as organizing the decision-making group, conducting self-evaluation, identifying goals, choosing decision-making strategy, and assessing decisions. As the Table 1 shows, top and IS/IT managers play a big role in decision-making group; managers of other departments, third-party, and end-users are not so necessary; customers and stakeholders do not participate in this process. Self-evaluation before decision-making refers to that organization particularly assesses the current status of business and system. The findings show that most organizations consider the system performance and the IT-business alignment most important during the self-evaluation. Other major parts of evaluation are the assessment of the business performance and the current issues. The business environment and users/stakeholders/customers' opinions are usually not considered to be relevant. Four important elements of goals are budgets, issues-solving, optimizing the long-term and short-term performance. Most organizations consider the budget control should be the most important one, after which are solving the current issues and increasing the long-term performance. The short-term performance is not so urgent from the organizational perspective. The decision-making strategy refers to the tendency of the decision-making. There is no absolute best strategy for everyone, but a proper strategy for every desire. The tendency of ERP switching/reversion mostly reflects the focus on the cost-benefit, system or business performance, and time-saving, in which perusing the higher cost-benefit is the acknowledged tendency for most organizations. On the other hand, the other tendencies are also chosen by organizations with particular purposes. Finally, the decision-making assessment is the process for organizations with multiple decision plans to determine the final plan. The results indicate that most organizations will prepare and assess possible decisions, but not the potential impacts of each decision.

From the perspective of LEs, the weighted average of IS/IT managers (4.70) is the highest when assembling the decision-making group, as well as the IT-business alignment (4.50) related to the self-evaluation before decision-making. On the other hand, from the perspective of SMEs, IT-business alignment (3.83) is below the System

performance, the Business performance, and the Current issues. Meanwhile, the Time-saving (4.17) gets more attention by SMEs.

Table 1. Summary of decision-making preparations.

		Lest imp.	Less imp.	Imp.	More imp.	Most imp.	Weighted Average		
							Total (16)	SMEs (6)	LEs (10)
Members of the Decision-making group	Top managers	0.00% 0	0.00% 0	0.00% 0	50.00% 8	50.00% 8	4.50	4.33	4.60
	IS/IT managers	0.00% 0	0.00% 0	0.00% 0	50.00% 8	50.00% 8	4.50	4.17	4.70
	Other managers	0.00% 0	0.00% 0	25.00% 4	68.75% 11	6.25% 1	3.81	3.33	4.10
	Third-party (Consultant or vendor)	0.00% 0	0.00% 0	68.75% 11	31.25% 5	0.00% 0	3.31	3.17	3.40
	End-users	0.00% 0	12.50% 2	68.75% 11	12.50% 2	6.25% 1	3.13	3.00	2.90
	Customers	31.25% 5	62.50% 10	6.25% 1	0.00% 0	0.00% 0	1.75	1.83	1.70
	Stakeholders	25.00% 4	75.00% 12	0.00% 0	0.00% 0	0.00% 0	1.75	1.67	1.80
Self-evaluation before decision-making	System performance	0.00% 0	0.00% 0	0.00% 0	75.00% 12	25.00% 4	4.25	4.33	4.20
	IT-business alignment	0.00% 0	0.00% 0	12.50% 2	50.00% 8	37.50% 6	4.25	3.83	4.50
	Business performance	0.00% 0	0.00% 0	0.00% 0	81.25% 13	18.75% 3	4.19	4.17	4.20
	Current issues	0.00% 0	0.00% 0	6.25% 1	81.25% 13	12.50% 2	4.06	4.17	4.00
	Business environment	0.00% 0	18.75% 3	75.00% 12	6.25% 1	0.00% 0	2.88	2.67	3.00
	Users/stakeholders/ customers' opinions	12.50% 2	62.50% 10	18.75% 3	6.25% 1	0.00% 0	2.19	2.83	1.80
Goals of ERP switching/reversion	Budget (cost, time, manpower, etc.)	0.00% 0	0.00% 0	0.00% 0	25.00% 4	75.00% 12	4.75	4.83	4.70
	Solving current issues	0.00% 0	0.00% 0	12.50% 2	43.75% 7	43.75% 7	4.31	4.67	4.10
	Long-term performance	0.00% 0	0.00% 0	12.50% 2	81.25% 13	6.25% 1	3.94	4.00	3.90
	Short-term performance	0.00% 0	18.75% 3	75.00% 12	0.00% 0	6.25% 1	2.94	3.00	2.90
Decision-making strategy	Cost-benefit	0.00% 0	0.00% 0	0.00% 0	50.00% 8	50.00% 8	4.50	4.33	4.60
	Increasing system performance	0.00% 0	0.00% 0	25.00% 4	56.25% 9	18.75% 3	3.94	4.33	3.70
	Increasing business performance	0.00% 0	6.25% 1	25.00% 4	62.50% 10	6.25% 1	3.69	3.83	3.60
	Time-saving	0.00% 0	6.25% 1	43.75% 7	31.25% 5	18.75% 3	3.63	4.17	3.30
Assessment	Possible decisions	0.00% 0	0.00% 0	0.00% 0	81.25% 13	18.75% 3	4.19	4.00	4.30
	Potential impacts	0.00% 0	0.00% 0	43.75% 7	43.75% 7	12.50% 2	3.69	3.83	3.60

4.4. Decision-making period

Decision-making period refers to the time period of executing the decision plan. Major topics in this period consist of the reasons of decision-making, critical issues, and procedures of decision-making. As Table 2 illustrated, the top three common reasons for ERP switching/reversion are the existing critical issues in the management processes, old ERP system, and ERP vendor. From the perspective of LEs, the existence of critical issues in the ERP vendor (4.11) is considered as the most important reason. The Needs of business innovation/restructuring (3.83) is considered as the third important reason by SMEs, meanwhile, Top management focuses on the new ERP trends (3.50) is considered as important as the Critical issues in the old ERP vendor (3.50).

Based on the findings of Huang [37], twelve critical issues are provided for participants to rate. The rating result from the highest to the lowest is in Table 3. There are a few differences in the view of SMEs and LEs separately. Overall, the issue of Integrate needs and the New system ability evaluation have the same ratings, however, from the perspective of SMEs and LEs, the latter is higher than the former. SMEs consider the New system ability evaluation issue (4.17) as the second important issue followed by the issues of Misfit (4.00) and Limited customer support (4.00). On the other hand, LEs only consider the issues of Limited customer support (3.11) as the eighth critical issue.

Ten important events during decision-making period are identified based on the secondary data in the following. Participants were requested to choose and sort those events based on their own experiences. The overall result is showed in Table 4, which is as same as the results of LEs.

From the perspective of SMEs, the procedure is "DAEFBCGIHJ", some difference occurs from step two to step six.

- (A) Build the decision-making group.
- (B) Evaluate the internal environment to understand the capacity (time, finance, people) of the organization and the budget.
- (C) Evaluate the external environment to understand the capacity (time, finance, people) of the organization and the budget.
- (D) Identify the current issues of the organization.
- (E) Identify the goals of the organization.
- (F) Recognize the tendency of the organization on IS and business to choose the suitable decision strategy.
- (G) Proposition of multiple decisions.
- (H) Proposition of one single decision.
- (I) Assess potential impacts of every considerable decision.
- (J) Compare potential impacts to principles, goals, capacity, etc. to decide the final adoption.

Table 2. Summary of the reasons of decision-making.

	Lest imp.	Less imp.	Imp.	More imp.	Most imp.	Weighted Average		
						Total (15)	SMEs (6)	LEs (9)
Critical issues in the management processes	0.00% 0	0.00% 0	20.00% 3	66.67% 10	13.33% 2	3.93	4.33	3.67
Critical issues in the old ERP system	0.00% 0	0.00% 0	26.67% 4	60.00% 9	13.33% 2	3.87	4.33	3.56
Critical issues in the old ERP vendor	0.00% 0	0.00% 0	20.00% 3	73.33% 11	6.67% 1	3.87	3.50	4.11
Needs of business innovation/restructuring	0.00% 0	0.00% 0	46.67% 7	46.67% 7	6.67% 1	3.60	3.83	3.44
Required by headquarters/collaborating organizations	0.00% 0	0.00% 0	93.33% 14	6.67% 1	0.00% 0	3.07	3.17	3.00
Top management focuses on new ERP trends	0.00% 0	13.33% 2	66.67% 10	20.00% 3	0.00% 0	3.07	3.50	2.78

	Lest imp.	Less imp.	Imp.	More imp.	Most imp.	Weighted Average Total (15)	SMEs (6)	LEs (9)
Recommendations from the consultant/vendor	0.00% 0	60.00% 9	40.00% 6	0.00% 0	0.00% 0	2.40	2.83	2.11
Required by the stakeholder/end-users	40.00% 6	40.00% 6	20.00% 3	0.00% 0	0.00% 0	1.80	2.33	1.44
Pushed by the pressure coming from the industry	33.33% 5	60.00% 9	6.67% 1	0.00% 0	0.00% 0	1.73	1.50	1.89

Table 3. Summary of the critical issues related to the ERP switching/reversion.

	Lest imp.	Less imp.	Imp.	More imp.	Most imp.	Weighted Average Total (15)	SMEs (6)	LEs (9)
Top management support	0.00% 0	0.00% 0	0.00% 0	73.33% 11	26.67% 4	4.27	4.50	4.11
Misfit	0.00% 0	0.00% 0	26.67% 4	46.67% 7	26.67% 4	4.00	4.00	4.00
Integration needs	0.00% 0	0.00% 0	26.67% 4	73.33% 11	0.00% 0	3.73	3.83	3.33
New system ability evaluation	0.00% 0	0.00% 0	33.33% 5	60.00% 9	6.67% 1	3.73	4.17	3.44
Limited customer support	0.00% 0	0.00% 0	53.33% 8	46.67% 7	0.00% 0	3.47	4.00	3.11
Vendor lock-in	0.00% 0	0.00% 0	60.00% 9	40.00% 6	0.00% 0	3.40	3.67	3.22
Data migration	0.00% 0	0.00% 0	73.33% 11	20.00% 3	6.67% 1	3.33	3.50	3.22
New business logic	0.00% 0	0.00% 0	73.33% 11	26.67% 4	0.00% 0	3.27	3.33	3.22
Issues from implementation strategy of old system	0.00% 0	0.00% 0	86.67% 13	13.33% 2	0.00% 0	3.13	3.17	3.11
New technology prevalence	0.00% 0	0.00% 0	93.33% 14	6.67% 1	0.00% 0	3.07	3.17	3.00
New risks	6.67% 1	53.33% 8	26.67% 4	13.33% 2	0.00% 0	2.47	3.17	2.00
Stakeholder/end-user management	6.67% 1	73.33% 11	20.00% 3	0.00% 0	0.00% 0	2.13	2.50	1.89

Table 4. Summary of the procedures of the decision-making.

	1	2	3	4	5	6	7	8	9	10	Total
D	86.67% 13	13.33% 2	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	15
E	0.00% 0	53.33% 8	46.67% 7	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	15
A	13.33% 2	33.33% 5	33.33% 5	6.67% 1	13.33% 2	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	15
B	0.00% 0	0.00% 0	13.33% 2	46.67% 7	20.00% 3	6.67% 1	6.67% 1	0.00% 0	0.00% 0	6.67% 1	15
C	0.00% 0	0.00% 0	0.00% 0	13.33% 2	46.67% 7	20.00% 3	6.67% 1	6.67% 1	6.67% 1	0.00% 0	15
F	0.00% 0	0.00% 0	6.67% 1	26.67% 4	6.67% 1	60.00% 9	0.00% 0	0.00% 0	0.00% 0	0.00% 0	15

	1	2	3	4	5	6	7	8	9	10	Total
G	0.00% 0	0.00% 0	0.00% 0	6.67% 1	13.33% 2	0.00% 0	73.33% 11	6.67% 1	0.00% 0	0.00% 0	15
I	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	6.67% 1	6.67% 1	60.00% 9	26.67% 4	0.00% 0	15
H	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	26.67% 4	53.33% 8	20.00% 3	15
J	0.00% 0	0.00% 0	0.00% 0	0.00% 0	0.00% 0	6.67% 1	6.67% 1	0.00% 0	13.33% 2	73.33% 11	15

5. The A2O decision model

Based on the process model of Rasmussen's Cognitive Control of Decision Processes [32] and the survey results, a descriptive model with a rational process - A2O model - is proposed (see Figure 2). The name of 'A2O' is constructed with the first letter of three constituent parts of the decision model - the Action, the Object, and the Outcome. This decision model covers all the main actions, objects, and outcomes during a decision-making of ERP switching/reversion in the Decline stage, and indicates the logic interaction among them. The A2O model refined multiple decision-making related behaviors accumulated from the empirical survey into three categories which are the skill-based, rule-based, and knowledge-based behaviors proposed by the Rasmussen's Cognitive Control of Decision Processes. The information of real ERP switch/reversion projects provided by the organizations gives rich and firm details about the Action, Object, and Outcome. The Rasmussen's theory helps to concentrate and simplify all the details. As we can see in Figure 2, three actions, Self-evaluate, Assess, and Adopt, as major linkages connect and push the decision-making process. The objects of actions consist of Business & IT/IS, Internal & External Environment, Tendency, and Considerable Decisions, which generate four outcomes - Issues & Goals, Status & Capacity, Decision-making Strategies, and Potential Impacts. All the terms are selected or concluded from the empirical information of real ERP switch/reversion projects.
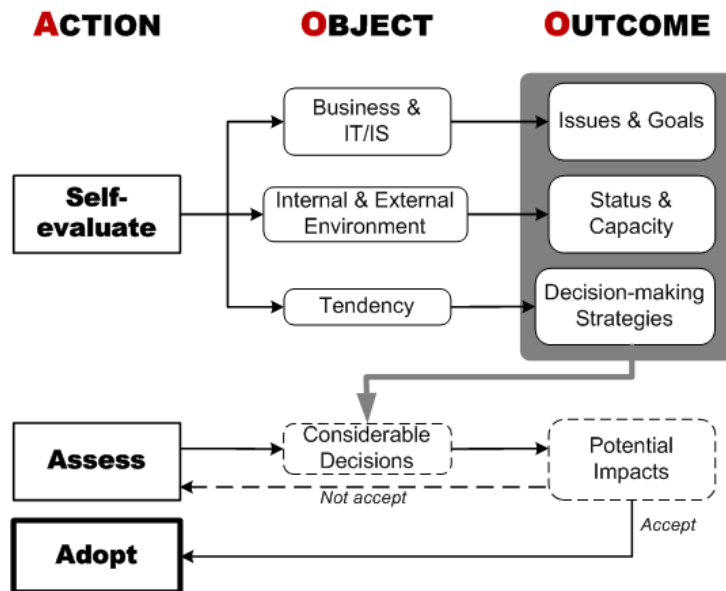

Fig. 2. The A2O decision model.

The flow of the A2O decision model starts at organizations' self-evaluation. The skill-based, rule-based, and knowledge-based behaviors are all indispensable during this event. The problems and needs of the business or IT/IS were usually accumulated during the operating period by regular staffs. The process of identifying the issues and goals belongs to the skill-based behavior. The process of evaluating the status and capacity of internal and external environment belongs to the rule-based behavior, which usually is done by specialists. Recognizing the tendency of decision-making strategies is the knowledge-based behavior, which requires a certain deeper understanding of the whole picture. The outcomes of self-evaluating determine the goals and principles of decision-making. According to the image theory of Beach [38], principles were defined as 'how things should be and how people ought to behave'. With the considerable decision plans, the next action - Assess - is for organizations to rethink and assess them to find the most suitable decision. The final action, the Adopt, represents the decision-making point, which is the ending of a decision-making process but also a beginning of implementing the decision.

5.1. Action

The action of Self-evaluate can be divided into three sub-actions - Identify, Evaluate, and Recognize. These terms originated from the Rasmussen's model. The sub-action of Identify underlines the specific facts people already noticed. The survey results indicate the top manager - one or multiple managers - who is in charge of the whole organization usually leads this action since after which the decision-making group is assembled in most organizations. The object of this sub-action is the business and IT/IS performance, of which the outcome is to identify issues and goals. In addition, there is a balance between 'what would I like to be' and 'what am I expected to be'. The former is the organizational perspective in which ideal visions and ambitions can be seen. On the contrary, the latter is the social perspective in which responsibility and contribution are required. This thinking requires a long-range perspective and more attention on long-term performance. Most importantly, all should under the feasible budget (cost, time, manpower, etc.) plan.

The sub-action of Evaluate is seeking conclusions from the phenomenon. According to the survey results, the subject of this action is usually the decision-making group. The object is the internal and external environment. The outcome is to pinpoint the current status and to list all possible inputs (capacity) to back up the upcoming changes. Organizations are surrounded by enormous data and information which reflect the condition of the internal and external environment. In this category, the business strategy and IT/IS strategy are the core thinking. Finding the limitation of organizations is a critical task in this action, such as manpower, capital, know-how, weakness, etc. By monitoring the variation of data and information, organizations can make the diagnosis of challenges and problems they are facing.

The sub-action of Recognize is an action that organizations try to assure the tendency on the decision-making strategy. The subject of this action is decision-making group. The object is the organization's tendency - a faster way to quantify the organization for measurement. The outcome is choosing the proper decision-making strategy. In order to make the best decision-making plan, it is necessary to understand the latest status of both system and business. A decision-making strategy consists of people, money, method, time, and most important - focus.

The action of Assess, contrarily, focuses on the potential possibility in the future which is also a key action to select optimal decision. The object is considerable decisions. The outcome is the possible impact of each decision's adaptation. After previous steps, organizations already have clear pictures about what are the problems, what do they want, and what can they devote. By comparing each potential impact of a decision to the principals, goals, and possible inputs, the best match as the outcome of this action is expected to be found. Until an acceptable match appears, the final action will not start.

The action of Adopt is a time point of agreement in organizations. All the members in decision-making group agree to one final decision, and the specific implementation plan of the decision is being prepared. This time point is considered to be the decision-making point.

5.2. Object

Business and IT/IS. In the organizational context, it represents both the visible and invisible side of an organization which organizations should review for identifying current issues and goals. The visible side refers to the business performance and the system performance. Current issues can be observed from this side. The invisible side, in other words, refers to the organizational culture. Some of the cultures are the rules that organization is based on, and some of the cultures are the habits of doing things for a long time. As large as the scale of organization is, the more diversity of organizational culture is getting into, which has a great impact on generating the goals.

Internal and External Environment. Ward et al. [39] summarized the stimuli that may affect aims of planning into four categories: the External Business Factors, the External Technology Factors, the Internal Business Factors, and the Internal Technical Factors. Specific activities were instanced in the External Technology Factors and the Internal Business Factors, which indicates that the internal factors dominate the business environment and the external factors dominate the technology environment. The internal and external environment, in general, includes the IT-business alignment, business environment, and the users/stakeholders/customers' opinions. The survey results indicate LEs consider the IT-business alignment most important. One reason is that a better IT-business alignment in LEs is more different to reach than in SMEs since the larger scale of both IS and the organization will increase the complexity.

Tendency. According to this research, there are usually two kinds of tendency involving the decision-making in the decline stage related to ERP switching/reversion. First, the business-based internal adjustment, which refers to organizations focus more on internal business. By using IS/IT as an auxiliary, they intend to make business innovations to achieve long-term success. Second, the technology-based external adjustment, on the contrary, focuses on external technological development. Technology-based innovation - adjusting the business to fit into new IS/IT - is the main source to gain competition. No matter organizations tend to prefer the business gain or the technological advantage; in spite of having successful decision-making consciousness, a rational cost of the decision-making should also be taken into consideration.

Considerable Decisions. Based on organizations' self-evaluation, organizations should have listed their own considerable decision(s) related to ERP switching/reversion. Huang [11] suggests the terms of the Decommission and the Life Extension describe this period in the Decline stage. Overall, besides the actual case of decisions, other considerable decisions go into the following categories (Table 5).

Table 5. Considerable decisions.

	Considerable Decisions	Description
Decommission	New system old vendor	Retire the old system and implement the new system with the old vendor.
	New system new vendor(s)	Retire the old system and implement the new system with the new vendor(s).
	Home-made system	Retire the old system and build a new system from the scratch on one's own.
	Returning to the former system	Retire the old system and return to the former system.
	No system	Retire the old system with no new system implementation or new technological outbreak in another level.
Life Extension	Working with the current vendor	Prolong the life of the current system with old vendor.

It is hard to image organizations which have experiences of using IS system choose to not use any information system at all. However, as long as the percentage of possibility is not zero, it is still worth to look into. Two possible thinking of no system which is completely opposite is the traditional thinking and the Big-Bang thinking. The former one has its advantages, after all, the history of business with IS/IT is way shorter than the traditional business history. The later one

has its possibility, which higher technology, such as Cognitive Radio [40], Brain-Computer Interfacing [41], Brain to brain communication system [42], etc., will end the current era of IS/IT.

5.3. Outcome

Issues and Goals. There are two types of goals and issues in organizations - the short-term ones and the long-term ones. In this context, the goals and issues here tend to be the long-term ones, which are harder to be achieved and solved. Generally speaking, business strategy and IT/IS strategy are considered to be an essential core in organizations [43]. The goals can be seen as a simplified result that organizations can get by using those strategies. Organizations can choose any strategies as long as the desired result can be achieved. Goals also contain the aims of solving the current issues in business and IT/IS. According to the results of this survey, we have an overall image of issues and goals of organizations facing ERP switching/reversion. Cost reduction is the primary goal which also contains refining the accountant processes. Beside of solving various issues, the expected long-term performance by SMEs and LEs is a little different. In particular, based on the secondary case data, SMEs focus more on the flexibility of new ERP system to deal with the variation of the market; LEs, on the other hand, focus more on internal management control/reconstruction and overseas expansion.

Status and Capacity. By evaluating the internal and external environment, the status and capacity of organizations can be estimated. The status refers to the business and system performance, the IT-business alignment, opinions of the various end-users, business environment, etc. the capacity represents the financial/managerial/technical strength of organizations. During the survey, LEs considers the status of IT-business alignment should be paid the most attention to. However, a qualified tool for assessing it is missing in nearly all cases, and only critical issues related to the system and business performance are usually used. The survey results also point out that organizations pay less attention to the business environment and end-users' thoughts in the Decline stage.

Decision-making strategies. It means how do organizations tend to make decisions. Generally, organizations can use the most common decision-making method to get the destination. However, the costs will vary. Apparently, organizations should put more efforts on self-evaluation, and build specific decision-making strategy based on what they have got. Indeed, the survey results also confirmed that most organizations put the cost-benefit first, and then choose the tendency of technology-focused or business-focused. For some SMEs, the time-saving also takes a large part in their decision-making strategies.

Potential Impacts. Since choosing one decision means giving up other possibilities, calculating potential impacts is one kind of risk management. In order to find out the optimal decision, a pre-analysis on potential results is expected. Although organizations may have their own checkpoints, common items are including of budget, human resource, time, benefit, productivity, competitiveness, flexibility, vendor's strength, etc. According to the case data, only four organizations had a single option from the beginning, and other eleven organizations all experienced the assessing process to assess multiple ERP packages from two to ten vendors.

6. Implications

6.1. Fulfill the blank of ERP life cycle theory

A decade before, when most organizations are in the implementation, use, or maintenance stage, the existence of the Decline stage is not even in the consideration by the majority both in practice and academy. Even now, there are IS professionals who still question the authenticity of the Decline stage. Hence, one of the implications of this research is finally fulfilling this blank in the ERP life cycle. Different from the expectations of most IS professionals that the ERP life cycle ends with contentiously improvement and transformation [7], the coming of the Decline stage is unavoidable. In fact, an unsuccessful ERP implementation project is rarely the main reason of ERP abandonment [18], organizations make decisions about ERP switching/reversion in the Decline stage based on unsolvable critical issues in the management processes, the ERP systems, the ERP vendor, the needs of business innovation, etc. The benefits and features of new ERP trends, such as Cloud ERP and Mobile ERP, also play important parts during this accelerated

process. In the Decline stage, organizations conduct various self-assessments to pinpoint the critical issues before and to plan the new goals for the future, prepare themselves for the next ERP life cycle, and make decisions to choose, design, adopt, or perfect the new ERP systems. It is far more complicated than the pre-implementation phase for the first time. As a matter of fact, the pre-implementation and implementation phase in the traditional ERP life cycle theory are occurring and finished during the Decline stage, according to the empirical evidence. In other words, the pilot test of new ERP system usually starts in parallel with old ERP systems, and then the new ERP system officially goes live at the beginning of the new ERP life cycle.

6.2. Explore the critical issues in the Decline stage

In general, single research issue of ERP management in organization context disperses in independent research, and only is combined with literature reviews [44]. One major serial studies focused on implementation, management, support, and impact issues of ERP [45-51] was conducted through a Delphi method, in which ten major issue categories along with traditional ERP life cycle were highlighted. However, the high-count issues [49] show that the focus of researcher is still concentrating on the pre-implementation and implementation stage of ERP life cycle [44]. On the other hand, although many researchers have shown their concerns on the post-implementation phase, only two studies have paid attention to the issues in the Decline stage. As a research agenda seventeen years ago, Esteves and Pastor [18] suggested five issues in the Decline stage. Huang [37] pinpointed thirty-seven critical issues of seven categories in the Decline stage theoretically through a Delphi survey. Hence, another important implication of this research is to provide the empirical supports on exploring the critical issues in the Decline stage. As we can see from the results, Top management support, as a classical IS key issue, is still considered by organizations as the most critical issue. The next critical issues focus on the alignment between system and business. The evaluation of new ERP system is considered more important by SMEs. Issues related to the vendors are also in the top five critical issues. On the contrary, new trends [18, 37] and new business logic [37] which are considered as top issues, in theory, are not given much more value by organizations. Key issues identified can help organizations shaping their way of management in the Decline stage and choosing the next ERP system wisely.

6.3. Reveal the reality of ERP switching/reversion

One reality of ERP switching/reversion is that the average implementation period is about one year which is far more short than the first ERP implementation. Organizations, consultants, and vendors have more experience than before is one important reason, and another reason is the technological development which provides less cost and more efficiency. Although the time period varies due to the different size and business of organizations, another reality is that culture factor plays a more important role in ERP switching in non-English-speaking countries. Findings of this research show that most organizations chose domestic ERP system for the second time in Japan due to various reasons, such as the language problem, the different financial rule, the unique business practice, the inconvenient customer support, etc. With the rapidly technological developing, the difference of technological strength between traditional major foreign ERP vendors and domestic ERP vendors is shrinking. Also, organizations of ERP reversion not only adopt the newest version of the ERP system, more of them choose the new types of platform, such as cloud and private cloud. Those realities in the Decline stage might enlighten ERP vendors on product development and customer service. For consultants, it is more helpful to know the real needs of organizations for suggesting suitable products. For the organizations that have not introduced any ERP system yet, realize the experiences of other organizations can also help to conduct a rational plan.

6.4. Provide a practical decision model for organizations

The A2O decision model is based on the empirical experiences of organizations that have already gone through the whole process of ERP switching/reversion. As a process model, organizations and consultants can easily adopt the A2O model in practice or for reference. The part of self-evaluation is usually done without systematic method or procedure. Generally speaking, various issues in the system and routine business were accumulated in the managers of each department from time to time, which will become the primary goal in the end. This research also points out the insufficiency of internal and external environment evaluation, especially the lack of tools for continuously self-

evaluating on IT-business alignment, such as the Issue-based ERP Assessment Model [52]. Meanwhile, a definite and efficient decision-making strategy is also rare in most cases. All of these provide more research opportunities for researchers to look deeper.

6.5. Build the foundation for researchers interested in this period

This research is the only first step in exploring the Decline stage of ERP life cycle. Contrary to the number of organizations adopted ERP system for the first time, the sample is relatively small, and only in one country. Is there any difference in the Decline stage in English-speaking countries or between developing and developed countries? Are there other utility decision-making models? Are there other critical issues in this period and how they vary with time, region, or industry? What are the critical factors that lead to the ERP switching/reversion? What about the third time? Does the Decline stage exist in the SaaS? There are still many unsolved research questions might interest researchers. As the first example, this research explores one side of this period and builds a certain theoretical and practical foundation for other researchers who may interest in this topic.

7. Conclusion

By adopting the questionnaire survey and secondary data, this research aims to explore the reality of organizations in the Decline stage of ERP life cycle and to form a practical process decision model for organizations faced ERP switching/reversion. In order to cover the key events in the Decline stage, the survey is designed to consists of Basic information, Experienced ERP projects, Preparations for decision-making, and Decision-making period, of which the data is also analyzed for learning the difference between SMEs and LEs. Based on the process model of Rasmussen's Cognitive Control of Decision Processes and the survey results from eighteen experienced organizations, a descriptive model with a rational process - A2O model - is proposed. The A2O decision model covers all the main actions, objects, and outcomes during a decision-making of ERP switching/reversion in the Decline stage, and indicates the logic interaction among them. In regarding to the research question, the proposed model provides a sound method for making decisions related to switch the ERP system. Three actions - Self-evaluate, Assess, and Adopt, as major linkages, connect and push the decision-making process. The objects and outcomes of Self-evaluate action need more attention and time period to be thought about regardless the sequence of them. To Assess the Considerable Decisions and get the Potential Impacts before decision-making is also very crucial.

One of the theoretical implications of this research is fulfilling this blank in the ERP life cycle. Another important theoretical implication of this research is to provide the empirical supports on exploring the critical issues in the Decline stage. Key issues identified can help organizations shaping their way of management in the Decline stage and choosing the next ERP system wisely. Organizations and consultants can easily adopt the A2O model in practice or for reference. From the practical perspective, the revealed realities in the Decline stage might enlighten ERP vendors on product development and customer service. For consultants, it is more helpful to know the real needs of organizations for suggesting suitable products. For the organizations that have not introduced any ERP system yet, realize the experiences of other organizations can also help to conduct a rational plan. Some limitations of this research remain. One of them is the scope of the survey sample. Similarly, the sample with geographical limitation also restrained the possible variety. The questionnaire was responded by one staff of each organization, which might bring certain subject opinions related to the decision-making period. Nevertheless, as the first example, this research explores one side of this period and builds a certain theoretical and practical foundation for other researchers who may interest in this topic. There are still many unsolved research questions might interest researchers and more research opportunities for researchers to look deeper.

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Biographical notes

Author
Tingting Huang is a Ph.D. researcher at the Graduate School of Economics and Management of Tohoku University. She has years of empirical experience in e-business, media, distribution, marketing, project management and other business practices. She has conducted research projects include the Enterprise Resource Planning (ERP) system in the organizational context, IT-business alignment assessment, decision-making on ERP switching, etc. Her current research interests include new generations of information systems and digital enabled innovations.

www.shortbio.org/yoruhuang@gmail.com