Chapter 4
Emergent Theory for Enterprise Resource Planning Upgrade Decision: A Multiple Case Study

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ABSTRACT

This chapter is based on four case studies and the findings are based on three rounds of qualitative data coding. This study finds that the type of business benefits expected to be derived from an ERP upgrade project, and the similarities between a firm and a new ERP system business processes have a strong impact on an ERP upgrade decision. Strategic business benefit has a relatively high impact on the upgrade decision than the managerial and operational business benefits. In contrast, symbols attached to an ERP system and top management supports are not salient factors influencing the ERP upgrade decision. However, based on further analysis of the pattern-matching of cause-effect relationships tested in this study, this research suggests that top management supports are necessary but not a sufficient factor to justify for an ERP upgrade, when there are lack of strategic business benefit incentives and similarity between a firm and a new ERP system business processes. This also indicates that ERP upgrade decisions are made rationally rather than habitually and socially defined.

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INTRODUCTION[1]

Enterprise Resource Planning (ERP) upgrade is one of the major activities in ERP maintenance 'iceberg' (Ng, 2011). ERP upgrade, from the ERP-clients' perspectives, requires extensive attentions and efforts. But, on-going business improvement and benefit-realization are necessary for this kind of enterprise system (Seddon, Calvert, & Yang, 2010). This is in-line with the initial reason, for organizations to embark on lengthy, expensive and stressful ERP projects in the first place (Panorama, 2017). However, according to the latest Panorama's 2017 ERP market survey, 37% of ERP client-organizations realize less than half of the anticipated business benefits and only 45% of them recoup their ERP software investment costs within three years (Panorama, 2017).

ERP market is reaching maturity, therefore the vast majority of the installed base are typically in ERP upgrade cycles (Jimenez & Lee, 2011). Even though a typical ERP upgrade cycle is between five to seven years (Acumatica, 2010), some organizations will put off their ERP upgrade project in order to wait for the return on investment from previous investment (Paul, 2008). This issue gets worsen considering the fact that conducting an ERP upgrade project is risky as it has a higher total cost of ownership and uncertainty with unproven fresh solutions, such as SAP S/4 Hana, Oracle Cloud and Microsoft Dynamics 365 (Kimberling, 2017).

Prior researches in ERP upgrade can be broadly divided into practice-oriented and theory-oriented research outcomes. Practice-oriented studies, typically meant to prescribe what to do, focus on issues such as critical success factors (Nah & Delgado, 2006; Olson & Zhao, 2006) and best practices (Beaty & Williams, 2006; Herschberg, 2004; Paul, 2009). On the other hand, theory-oriented output studies, i.e. theory-building in particular, are focussing on explaining why an ERP upgrade phenomenon happened, (Khoo & Robey, 2007; Ng, 2006, 2011). However, most of these theory-testing papers merely propose theoretical frameworks useful to understand this phenomenon but they have not provided sufficient empirical findings to support or refute the proposed research frameworks.

As a result, we know very little about ERP upgrade decision, and there is a paucity of empirical evidence and theory in the field of ERP upgrade decision (Dempsey, Vance, & Sheehan, 2013; Law, Chen, & Wu, 2010). An ERP upgrade decision is defined as "a decision made which results in the installed old ERP version (partly or as a whole) being replaced by a newer version either from the same or different vendor's product," (Ng, 2011). Thus, this study is meant to provide some empirical data: (1) to support (or refute) the suitability of previously proposed concepts for ERP upgrade decision, and (2) to offer more generalizability power and enhance prior ERP upgrade decision concepts developed from case studies. The research questions

addressed here are: what is the nature of ERP upgrade decision, and how do firms justify their upgrade decisions in a competitive and dynamic business environment.

ERP UPGRADE THEORETICAL BACKGROUND

Khoo & Robey (2007) describe ERP upgrade decision as contingent upon or dependent on a set of criteria. The set of criteria given by the authors includes internal organization requirements such as business needs, IT needs and the type of risk mitigation policy adopted (e.g., being an IT exploiter, early adopter or efficient follower – see (Maier, Rainer Jr., & Snyder, 1997)); external dependence on vendor's ERP software functionality and technical support; and an organization's internal resource availability for conducting an ERP software upgrade. The findings are consistent with the logic and reasoning in the contingency theory. This means that there is no one best way or best set of indicators for making an ERP upgrade decision. However, we believe that this is a common set of criteria that companies, in general, use in making ERP upgrade decision rationally.

On the other hand, Dempsey, Vance and Sheehan (2013) propose that ERP upgrade decision is mainly based on the weighting between prohibiting factors and motivation factors. The prohibiting factors are found to be the extent of customization, risk of business disruption, lack of confidence in new version, and cost of upgrade. In contrast, the motivating factors are competitive advantage, benefit realization, consolidation of resources, soaring cost/level of maintenance, and withdrawal of vendor support.

Similar to an ERP implementation project, an ERP upgrade decision has to be justified by its value, usefulness, and contribution to the business of client-organizations (Ng, 2011). Based on the critical review of trade press reports and academia research studies, Ng (2011) proposes an ERP upgrade decision conceptual model consisting of four basic concepts that have high impacts on the ERP upgrade decision. They are incentives or benefits for doing an upgrade (the extrinsic motivating factor), prior experiences and perceptions of an ERP system (the symbols attached to an ERP system), the fit (or similarity) between an ERP system and a firm's business processes, and the organizational issue of top management supports.

Both Khoo & Robey (2007) and Dempsey, Vance & Sheehan (2013) ERP software upgrade decision criteria are mainly based on rational (or economic) factors. On the contrary, Ng (2011) ERP software upgrade decision criteria covers both rational (such as incentives for doing an upgrade, the fit between a new ERP software and a firm's business processes, and the top management supports) and emotional (i.e. prior experiences, perceptions or the symbols attached to an ERP system) factors. A comparison among the three studies abovementioned is given in Table 1.

Table 1. A Comparison of prior studies of factors influencing an ERP upgrade decision

Previous Studies	Research Method & Number of Cases Adopted	Business Needs	IT Needs	Risk Mitigation Policy Adopted	Dependency on Vendor	Resource Availability	Extent of Customization	Symbols Attached	Top Management Supports
Khoo & Robey (2007)	Case study method – based on ONE Fortune 500 company	✓	✓	✓	✓	✓			
Dempsey, Vance and Sheehan (2013)	Case study method – based on ONE multinational company	✓ (competitive advantage, benefit realization)	✓ (consolidation of resources, soaring cost/ level of maintenance)	✓ (risk of business disruption)	✓ (with-drawal of vendor support)	✓ (cost of upgrade)	✓	✓ (confi-dence in new version)	
Ng (2011)	Literature review	✓ (incentive or benefit)	✓ (incentive or benefit)	✓ (symbols attached)	✓ (incentive or benefit)	✓ (symbols attached – costly)	✓ (degree of fit or similarity)	✓	✓

This research is based on Ng (2011), which covers the four key ERP upgrade concepts of incentive, similarity between a new software and an existing system, top management supports and symbols attached to an existing ERP software. The detail descriptions of the four concepts are as follows.

Incentives – Research conducted by marketing research groups such as Aberdeen Group (Aberdeen Group, 2010) and AMR Research (Swanton, Samaraweera, & Klein, 2004) show that one of the top factors to consider in an ERP upgrade decision is whether there is any apparent value and immediate returns from an ERP upgrade. This is the motivating forces that drive an ERP upgrade decision (Khoo & Robey, 2007). In general, the incentives or benefits that can be obtained from an ERP system can be grouped into two perspectives, i.e., the technology and business needs (Ng, 2006; Rahim, Shanks, & Johnston, 2011). The incentives possibly derived from an ERP upgrade, from the technology perspective, can be conformity to government regulation (such as financial and environmental compliance), the information technologies adopted by the supply chain and best practices (such as internal control and risk management) (Kumar, 2008), better IT platform such as service-oriented architecture and better integration with other systems (Bjorlin, 2008), and fewer hardware & software costs and maintenance costs (Jimenez & Lee, 2011). From the business perspective, the incentives for upgrading an ERP system for strategic and managerial business benefits may include enhancing competitiveness (Dempsey et al., 2013), creating a foundation for other business initiatives such as business intelligence and customer relationship management (Beaumont, 2004), better business processes and decision-making (Seddon et al., 2010), new and enhanced functionality in the new release (Columbus, 2013; Jimenez & Lee, 2011). For operational business benefits, this will include business transactions cycle time reduction and operational cost reduction (Ng & Chang, 2009), and process optimization and improved access to information (Seddon et al., 2010).

The presence of incentives for doing an ERP upgrade is considered as an important element for convincing and persuading top management to keep their ERP systems up to date. However, in the absence of incentives for doing an ERP upgrade, there will be difficult to justify the decision and obtain buy-ins to take up on this effort.

Symbols attached – according some researchers, information systems are used and introduced primarily for their symbolic value (Feldman & March, 1981). However, this initial symbolic value(s) may change after it has been used and interacted with other people who use the system or have prior upgrade experience. This is because not all users experience positive impacts from the system use or software upgrade (Khoo, Robey, & Rao, 2011). Empirical findings by Ng and Tan (2004) suggest that symbolism attached to an ERP system is another important component to be considered in examining ERP upgrade decision. Some of the symbols found to be attached to an ERP system are extravagance costs of an ERP upgrade project, the

sense of uncontrollability with the new changes of a new ERP upgrade software system and reliance on vendor for supports (Ng & Tan, 2004). Some companies perceive ERP upgrade as expensive and risky to business (Swanton, 2004), and a painful experience (Wailgum, 2010). Others find frequent upgrade can be costly and disruptive (Kimberling, 2010).

Positive symbols associated with an ERP system increase one's willingness to upgrade the system for continued use as it is perceived as a worthwhile effort. On the other hand, negative symbols attached to an ERP system will make one feels doubtful and unwilling to accept the challenges to upgrade the system.

Similarity with a firm's internal business processes – Some ERP client-organizations prefer to delay an ERP upgrade because of the new version does not conform to their ways of doing business (Swanton et al., 2004). This is especially the case for some ERP client-organizations, which might have done a lot of customizations to the ERP software during their initial implementation projects. According to Columbus (2013), misfits in business processes will result in customizing an upgrade system, which costs tenfold in services to every dollar spent on the software upgrade itself. This is similar to the initial ERP implementation project, whereby business process fit between an ERP system and the implementing-firm has impacts on the upgrade decision as it can increase the risks and uncertainties involved in an upgrade project (Ng, 2013; Wang, Klein, & Jiang, 2006). As a result, some ERP client-organizations may delay their ERP upgrades and keep an outdated or unsupported version of an ERP system until they can justify the risks and costs of an ERP upgrade with its values. In this situation, their systems are not up to the vendor's standard of state-of-the-art software or business processes. Thus, the similarity between a firm's existing business process and a new ERP software business processes is a practical factor that has an impact on an ERP upgrade decision. The more similarities in the two systems' business processes the more buy-ins and lesser resistances will be for the upgrade decision.

Top management supports – Some organizations find that ERP upgrade project is a good opportunity to consolidate various ERP software instances to obtain a better business process efficiency (Bjorlin, 2008). In contrast, other companies perceive that as long as the existing business operation is functioning properly then they do not have the urgent need to do upgrade (Aberdeen Group, 2010). In this case, there will be low management supports for the upgrade decision. In overall, different organizations have different top management perceptions for when the right time for conducting an ERP upgrade project is. Prior literature on ERP implementation has proven that top management supports are critical for the success of the implementation project (Wang, Shih, Jiang, & Klein, 2008). Likewise, getting the supports and commitments from the top management are crucial as upgrade causes changes in an organization and these require strong leaderships for change

management (Jimenez & Lee, 2011). Having top management supports for an ERP upgrade suggests that, from the management perspectives regardless operationally, tactically or strategically, there is a need and benefit for doing so. As a result, there will be fewer obstacles and more supports for making this decision.

Based on the above professional trade press and academic literature, related empirical evidences and theoretical assumptions associated with making an ERP upgrade decision, this study composes four initial theoretical propositions to be tested in this research. They are as shown in Table 2. The key concepts or independent variables considered are the incentives factor (Khoo & Robey, 2007), symbols attached to an ERP system (Khoo et al., 2011; Ng & Tan, 2004), similarity between a firm and a new ERP system business processes (Ng, 2013; Wang et al., 2006), and supports from top management (Wang et al., 2008); and the dependent variable is the ERP upgrade decision, i.e. upgraded willingly versus unwillingly, a.k.a. forced upgrade. This study focusses on the perspective of the decision makers, i.e. the top management.

RESEARCH METHODOLOGY

Case study research method is applied in this study as it allows multiple forms of inquiry that is useful to understand and provide detailed explanations of the phenomenon studied here. Positivist case study typology is adopted as we intend to provide detailed empirical evidence to validate existing untested propositions for ERP upgrade decision (Paré & Elam, 1997). According to Yin (2003), this type of case study is suitable for illustrating support or challenging theoretical assumptions held prior to the data collection.

The criteria, i.e. the control variables used in this study, set for choosing the right case study are that: (1) all companies come from the same industry, i.e. IT-related manufacturing industry, and (2) are located in Taiwan. For literal replication, two

Table 2. Initial theoretical propositions tested in this study, adapted from Ng (2011)

	Description
Proposition-1:	Incentives have strong positive impacts on making an ERP upgrade decision willingly.
Proposition-2:	Positive symbols attached to an ERP system have strong positive impacts on making an ERP upgrade decision willingly.
Proposition-3:	The similarity between a firm and a new ERP system business processes has strong positive impacts on making an ERP upgrade decision willingly.
Proposition-4:	Supports from top management have strong positive impacts on making an ERP upgrade decision willingly.

ERP client-organizations are required and they have previously made their ERP upgrade decisions willingly. On the other hand, for theoretical replication, two ERP client-organizations are chosen such that they have done their ERP upgrade unwillingly or by force. Case study protocol (with interview questions around the theories) is developed and used as a guide during the data collection process.

The targets of respondents in this study are the top executives (such as vice-president, CIO, and CFO) and different functional area key users, who involve in making ERP upgrade decision, are familiar with their ERP systems and are well informed about the characteristics of their ERP systems. Information is gathered with the intent of analyzing and interpreting about the phenomenon. Data collection methods applied here are (1) structured and semi-structured interviews; (2) documentations such as reports, procedure and manuals; and (3) participant observations. Participant observers in this study function as key informants, identify unknown individuals and data sources, and organize meetings in the organizations. They also serve to ensure construct validity in this study by reviewing the interview transcripts.

Prior to each interview, the interview questions are sent to the interviewees a week earlier in order to allow them to prepare or write down their responses for each question related to their prior and/or recent ERP upgrade decision. Whenever necessary, the researchers transcribe the interviews immediately after each interview. Then, the transcribed text is sent back to the interviewees to review the interview data to ensure the interpreted data is authentic and the same as its original intent and meaning, to ensure construct validity. In addition, chain of evidence, i.e. survey reports and multiple interviewees, are applied to ensure construct validity of variables considered in this study. For each case, a case study database is developed for ease of future data references and management, and to enforce reliability of this study. To achieve the internal validity of the findings, causal relationship and quotes from the interviews are used.

For data analysis, three rounds of coding are employed. (1) The first round involves using the In Vivo coding method. In this first round of coding, In Vivo coding – is used to identify the specific text segments, in all interview transcripts, those are relevant to and cause an ERP upgrade decision, i.e. the dependent variable. (2) The second round of coding makes use of the descriptive coding method (Miles, Huberman, & Saldaña, 2014). In this round, (i) descriptive code or interpretive code is assigned to the In Vivo codes, identified in the first round; and (ii) common descriptive codes belong to the same theme are grouped together. (3) The third round, hypothesis coding is adopted (Miles et al., 2014). In this round, (i) common themes of the causes of an ERP upgrade decision, found in the second round, are then mapped onto a set of codes, derived from deductive coding based

on the predetermined independent variables in our propositions in Table 2; and (ii) frequency counts of each cause are conducted.

In order to test the propositions in this study, (1) case comparison analysis (Flick, 2006; Yin, 2003) is conducted to confirm and identify how the incentives factor, symbols attached to an ERP system, similarity between a firm and an ERP system business processes and supports from top management differ between ERP client-organizations that are willingly and unwillingly decided to implement their ERP upgrade projects; (2) pattern-matching (Eisenhardt, 1989; Yin, 2003) is adopted to determine if the predicted key cause-effect patterns between independent and dependent variables defined before and after data collection are being matched; and (3) tabular displays and graphs (Leonard-Barton & Deschamps, 1988) are used to visualize the key cause-effect patterns and core themes represented by each case.

FINDINGS AND DISCUSSIONS

Four case studies were conducted and the characteristics of each case study were illustrated in Table 3 below. These case companies are located in Taiwan and belong to the manufacturing industry. As shown, two of the cases (labelled as Company W and Company R, for anonymous purpose) had willingly upgraded their ERP systems, whereas the other two cases (named Company S and Company T) were forced to upgrade their ERP systems. The latter two cases were forced to upgrade meant that they would delay or would not have upgraded their systems if they had the choices. They upgraded their ERP systems unwilling because of vendor supports termination for their software version, conformity to the international financial reporting standard (IFRS), lack of the understandings of the needs for an upgrade and lack of budget for it. The data collection was started in late 2011 and completed in 2012. A total of 25 interview transcripts were produced from the four case studies.

Proposition 1: Incentives Have Strong Positive Impacts on Making an ERP Upgrade Decision Willingly

Based on the results of the coding done in the interview transcripts, case-by-case, specific to the concept of "ERP upgrade incentive," 39 In Vivo codes are obtained. From this, we find that business benefit incentives can be broadly divided into three common theme categories, i.e. strategic, managerial and operational incentives. These three categories of coding scheme are consistent with the prior empirical evidence, see (Shang & Seddon, 2003). Examples of the descriptive codes for each incentive category are shown in Table 4. The illustrations of the direct quotes are as follows.

Table 3. Case studies characteristics

	Company W	Company S	Company T	Company R
Industry	Manufacturing industry (a leading global supplier of liquid crystal display)	Manufacturing industry (capacitors, transformers, consumer electronic products)	Manufacturing industry (optical storage media and CD packaging box, public listed company)	Manufacturing industry (top five Micro UPS manufacturers in the world, public listed company)
Number of employees	14,000	180	3,000	7,000
Enterprise size	Large (more than 200 employees)	SME (less than 200 employees)	Large (more than 200 employees)	Large (more than 200 employees)
Annual revenue	NTD$2.18 billion	NTD$600 million	NTD$28.4 billion	NTD$20 billion
Initial ERP system	In year 2005 – WorkflowERP	In year 2002 – WorkflowERP (Local ERP)	In year 2000 – SAP 4.6C	In year 1996 – MFG/PRO ERP system, QAD
Reasons for ERP implementation	(1) Business expansion (2) More effective working environment (3) Improving efficiency in internal administrative operations (4) Synchronizing all data coming from various plants	(1) Transforming its 20 years old company (2) Re-shuffling workforce (3) Improving company's productivity quality (4) Changing old and relatively poor ways of doing business (business reengineering)	(1) Integrating ERP information and optimizing workflow (2) Better understanding of the conditions and status of current business operations (3) Integration with foreign customers (4) Improving customer satisfaction (5) Meeting the needs of company's future rapid growth	(1) Centralized and integrated databases. (2) Supporting inter-company process (3) New business requirements (product cost and period-end cost allocation requirement)
Current ERP system	SAP ECC 6.0	Workflow ERP GP (Local ERP)	SAP ECC 6.0	SAP ECC 6.0
Frequency of upgrade	Twice	Once – delay and forced upgrade	Once – delay and forced upgrade	Once
Number of interviewees	Seven (vice-president, IT director/CIO, IT manager, financial director, IT personnel, SD key user, FICO key user)	Five (vice-president, IT manager, financial manager, production manager, ABAB member)	Seven (vice-president, ERP team manager, Purchasing vice manager, accounting vice manager, ABAB member, production key user, MRP key user)	Six (vice-president, sales key user, SAP team leader, SAP Basis member, MRP manager, finance key user)

Table 4. Case comparisons of different types of incentive perceived in an ERP upgrade decision – for proposition-1

	Incentive Or Business Benefit Categories*		
	Strategic (e.g., attract investor, future business expansion/growth, business profit, IT business strategies)	**Managerial** (e.g., better budgeting, planning, controlling, decision-making, unify business operations, compliance, maintenance supports)	**Operational** (e.g., bug-free, operational efficiency, data integration, operational control, unsatisfied users, working efficiency)
Company W	4/10 (40%)	2/10 (20%)	4/10 (40%)
Company S (forced upgrade)	0/4 (0%)	1/4 (25%)	3/4 (75%)
Company T (forced upgrade)	1/10 (10%)	7/10 (70%)	2/10 (20%)
Company R	6/15 (40%)	7/15 (47%)	2/15 (13%)

*Note: x/y represents the ratio and (%) represents the percentage of number of codes for a particular category of incentive over the total number of codes for all categories of incentive, in a company.

Company W, Vice-President: *The system needs to be upgraded because the operational scale of the company grows larger and larger. Our previous system cannot satisfy the needs of our company and is affecting the working efficiency of our employees. Therefore, we planned to upgrade the system.*

Company W, IT Director: *Upgrading our ERP system is to meet the growth of our company, the expansion of our business operation scale, have more strict operational control, and reduce business loss due to human errors.*

Company S, IT Manager: *We chose to delay the upgrade and the reason is that basically, a new version usually has a higher bug rate than an earlier version, because it has not been used for a period of time in the market and the unknown system bugs and errors are relatively greater.*

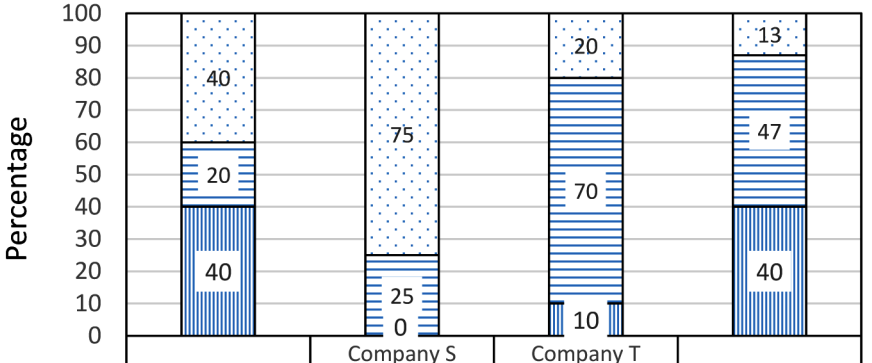
Company T, ERP Team Leader: *Due to the timeframe for complying to the Government laws, i.e. the Financial Supervisory Commission requests that all listed companies must satisfy the IFRS regulation from 2013, we must upgrade and integrate our ERP systems. Furthermore, the maintenance support for the SAP R3 4.6C was terminated too, so it must be upgraded.*

Company R, Sales Key user (Supervisor): *We upgrade our ERP system because of our business expansion, the ever-changing business environment. The business operations of our enterprise include Mainland China, Hong Kong, Macau and Taiwan. Combining all information from these four locations into a single platform, using an ERP system is required, as this can help in unifying the business operations, and increasing the business process efficiency. The financial operation of the triangular trades among Mainland China, Hong Kong, Macau and Taiwan can be enhanced by the new ERP.*

Cross-case analysis is then conducted. The key cause-effect pattern (which is based on dependent and independent variables as listed in Proposition-1) is analysed by using tabular display & graph, and pattern-matching among the four cases, as shown in Figure 1.

The data analysis in Table 4 shows that Company W that upgrade its ERP system willingly emphasizes more on the strategic incentives and operational incentives in making its upgrade decision. This result is has a similarity with the case of Company R that weighs more heavily on strategic incentives and managerial incentives in making its upgrade decision. Conversely, Company S and Company T those upgrade their ERP systems unwillingly are failing to foresee the strategic incentives or business

Figure 1. Respondents expressing their perceived type of incentives derivable from a new ERP system



	Company W	Company S (forced upgrade)	Company T (forced upgrade)	Company R
Operational	40	75	20	13
Managerial	20	25	70	47
Strategic	40	0	10	40

values in a new ERP software. The incentives they perceive are prevailing more on the managerial incentives and operational incentives (see Figure 1). This shows that constant cause-effect patterns present between the independent and dependent variables. Although proposition-1 seems to be supported in this study, it still requires some modification as such – *strategic business benefit incentives* have strong positive impacts on making an ERP upgrade decision willingly.

Proposition 2: Positive Symbols Attached to an ERP System Have Strong Positive Impacts on Making an ERP Upgrade Decision Willingly

Interview transcripts coding for the concept of "symbols attached to an ERP system" are conducted for each case-company. A total of 141 descriptive codes is identified. For each case, the descriptive codes can be grouped into positive and negative symbols (Table 5). Some examples of the descriptive codes for the positive symbols are: friendly-user interface, increase the work efficiency, well-designed system, centralized database, unified information platform, agile, and support multiple languages. Examples of the interview quotes are as follows.

Company W, Financial Director: *An ERP system is a necessary system; it increases the efficiency of human operation.*

Company S, Vice President: *An ERP system is a tool capable of reinforcing and increasing the management efficiency of our company, monitoring the operation processes of all departments, increasing the production efficiency, and reducing production and other management costs.*

Company T, ERP Team Leader: *ERP provides the integration of all the important business operating activities within a company. With an ERP system, all the departments can obtain standardized and unified information across all functional areas, reduce rework processes, reduce waste of resources, and increase work efficiency.*

On the other hand, the examples of the negative symbols attached to an ERP system are: customizations are required, more complicated, massive system, lack of familiarity, expensive, limited flexibility, and maintenance contract. For instance,

Company T, Basis Member: *ERP is a massive and complicated system. As a result, its hardware and network requirements are also larger.*

Company R, Finance Key User (Supervisor): *ERP system is an expensive IS system, collects various operational data, its data input is complicated, and in order to use it to produce personalized reports customizations are required.*

Company R, Vice President: *It is a comprehensive business processes that provides an integrated database but it has limited flexibility for system customization.*

Quantitative content analysis is then conducted and the total number of positive symbol counts and negative symbol counts in each case-company is tabulated in Table 5, for cross-case comparison. As shown, both Company W and Company R have a higher percentage of positive symbols attached to an ERP system than the negative symbols. However, Company S and Company T, where their ERP upgrade decisions are forced, also have the same effects, i.e. having more positive symbols attached to their ERP systems than the negative ones.

A closer look at the case-by-case comparison, it is observed that although Company R has the highest negative symbols attached to their ERP system (compared to the other three cases), the company still makes the decision to upgrade their ERP system. In contrast, although Company S has the highest positive symbols attached to their ERP system, the company's ERP system upgrade decision is forced, after delaying for nine years. As a result, there are mixed results for the observed relationship between an upgrade decision and positive/negative symbols attached to the ERP system (Table 5). Thus, proposition-2 is not supported in this study.

This finding suggests that there is no obvious association between symbol attached and ERP upgrade decision. This means that an ERP upgrade decision is not socially constructed in a social setting. This also indicates that difference in perceptions (i.e. the symbols attached to the system) after using the system do not seem to have much impacts on the upgrade decision. This finding may suggest that the strategic business benefit incentive supersedes the role of the symbol attached to an ERP system, in the process of making an ERP upgrade decision.

Table 5. Case comparisons for proposition-2

	Symbols Attached to an ERP System*	
	Positive	**Negative**
Company W	16/19 (84%)	3/19 (16%)
Company S (forced upgrade)	24/25 (96%)	1/25 (4%)
Company T (forced upgrade)	42/54 (78%)	12/54 (22%)
Company R	26/43 (60%)	17/43 (40%)

*Note: x/y represents the ratio and (%) represents the percentage of number of codes for a particular category of symbol over the total number of codes for all categories of symbol, in a company.

Proposition 3: The Similarity Between a Firm and a New ERP System Business Processes Has Strong Positive Impacts on Making an ERP Upgrade Decision Willingly

The results of the coding performed on the interview transcripts, for the four case studies, for the core theme associated with the "similarity between a firm and a new ERP system business processes" produce 34 descriptive codes. Examples of these codes are: not the same, ERP system is able to satisfy the need of our company, they are some differences, it is the same, completely the same, not exactly the same, almost the same, and has a few differences. These 34 codes are then reduced to three common theme categories, i.e. not the same, almost the same and the same, as shown in Table 6. The following is some illustrations of the interview transcripts.

Company W, IT Director: *Most of the new ERP software business process flows are the same with ours.*

Company W, Financial Director: *The new ERP software business processes are almost the same with our existing processes, even though some differences are observed.*

Company S, Production Manager: *The business processes in our existing ERP system and the new ERP software are not the same. ... [However,] limited changes can be made to the production business processes, as our company wants to minimize modifications to the new ERP software due to our budget constraint.*

Table 6. Case comparisons for proposition-3

	Similarity between a Firm and a New ERP System Business Processes*		
	1= Not the Same	2= Almost the Same	3= the Same
Company W	1/11 (9%)	7/11 (64%)	3/11 (27%)
Company S (forced upgrade)	4/5 (80%)	0/5 (0%)	1/5 (20%)
Company T (forced upgrade)	5/8 (63%)	1/8 (13%)	2/8 (24%)
Company R	0/10 (0%)	2/10 (20%)	8/10 (80%)

*Note: x/y represents the ratio and (%) represents the percentage of number of codes for a particular category of similarity over the total number of codes for all categories of similarity, in a company.

Company T, ERP Team Leader: *The work processes [in our previous ERP software and the new ERP software] were not the same. All customizations done in the previous version need to be redeveloped and tested in the new version of the ERP system.*

Company R, SAP Team Leader: *We selected and designed our ERP system business blueprint based on the SAP best practices. … The final ERP system is able to satisfy the need of our company.*

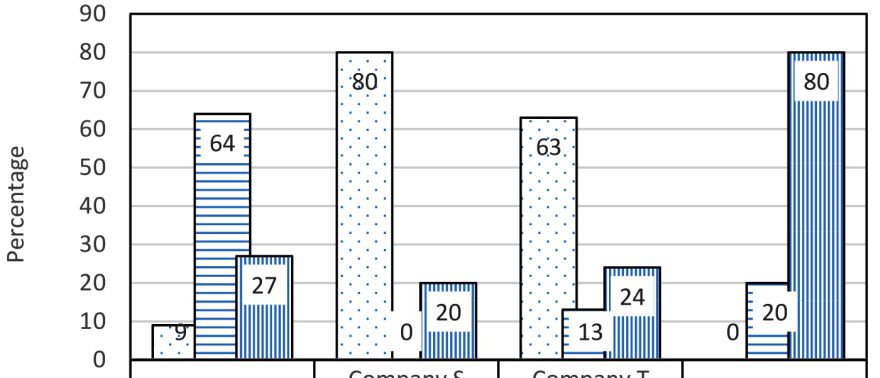
Subsequently, quantitative content analysis is conducted and the total number of codes belonging to each category is tallied and computed. The succeeding data analysis on Company W suggests that it has 91% of its descriptive codes belonging to "the same" and "almost the same" categories for "similarity between a firm and a new ERP system business processes." Company R, which implements its ERP upgrade willingly, also has the same result such that 80% of its descriptive codes for this theme falls into "the same" category. In comparison with the other two case companies, Company S and Company T, that prefer to delay their ERP upgrade (if they have the choice) have the highest percentage of descriptive codes for "not the same" for the "similarity between a firm and a new ERP system business processes." This indicates that there is a consistent pattern between the independent and dependent variables. Thus, there is a strong positive impact between the decision to upgrade an ERP system willingly and the similarity between a firm and a new ERP system business processes (see Figure 2). Based on this, the proposition-3 is supported by our empirical data here.

Proposition 4: Supports From Top Management Have Strong Positive Impacts on Making an ERP Upgrade Decision Willingly

The independent concept focused in this proposition is "top management supports." In this case, we concentrate the analysis of the interview transcripts, in each case study, on the interview questions that are particularly related to this concept. Thirty descriptive codes are produces for this concept. The descriptive quotes related to this core theme are found to be: interested in, surely interested, definitely provide the required supports, strongly supported, not interested, was not keen in supporting the upgrade, and did not really want to support the ERP system upgrade. These are categorized into two common themes, "not supporting" and "fully supporting." Examples of the quotes are as such:

Company W, Vice-President: *[The upgrade] is strongly supported by top management because the functionalities of the new system are superior to the previous one and it can increase the efficiency of users' business operations.*

Figure 2. Respondents expressing their perceived degree of similarity between their company and a new ERP system business processes



	Company W	Company S (forced upgrade)	Company T (forced upgrade)	Company R
Not the same	9	80	63	0
Almost the same	64	0	13	20
The same	27	20	24	80

Company S, Vice President: *Yes, we support our ERP upgrade. The efficiency and functionality, in the new ERP software, have been increased. These have been helpful to the overall business performance of our company.*

Company T, Accounting Vice-Manager: *The top management was not keen of supporting the upgrade of the previous ERP system. The reasons were the cost of upgrade was considerably expensive. Despite the fact that it was expensive, the ERP system must be upgraded due to the Government policies.*

Company T, Vice-President: *We did not strongly support the ERP upgrade because the performance of the new system upgrade and pricing were not clearly stated in the service contract of the ERP upgrade project, promoted by the ERP team.*

Company R, Material Manager: *The top management supports the system upgrade as there is a clear need to upgrade the system.*

In making the cross-case comparisons, it is found that the two cases, i.e. Company W and Company R in this study, that upgrade their ERP systems willingly do obtain full supports from their top management. Surprisingly, the other two case companies, where their upgrade decisions are not made willingly also have more than 50%

of their descriptive codes indicating the top management supports for their ERP upgrade decisions, see Table 7. Therefore, there is no stable pattern of cause-effect relationship between the ERP upgrade decision and top management supports. Thus, the empirical data in this study does not fully support our proposition-4.

We argue that top management supports are necessary for making an ERP upgrade decision but not a sufficient factor to justify for an ERP upgrade. This also indicates that ERP upgrade decisions are made rationally.

FURTHER ANALYSIS AND DISCUSSIONS

This study finds that ERP upgrade decision is highly related to the type of business benefits expected to be derived (or the type of business problems expected to be resolved by) from an ERP upgrade project. In general, it is observed that strategic business benefit has a relatively highest impact on the upgrade decision than the managerial and operational business benefits. The incentives or business benefits expected to be realized from an ERP upgrade does appear to be a strong factor influencing ERP upgrade decision (proposition-1). This finding is in line with prior studies conducted by Khoo and Robey (2007), and Dempsey et al. (2013).

Likewise, our empirical results here also suggest that the similarity between a firm and a new ERP system business processes has a strong impact on an ERP upgrade decision (proposition-2). This is consistent with the prior studies related to ERP system implementation success (Wang et al., 2008) and post-implementation system use success (Ng, 2013). However, symbols attached to an ERP system do not seem to be a strong differentiating- or salient-factor for the ERP upgrade decision (proposition-3). This finding is not consistent with Ng and Tan (2004). This is also

Table 7. Case comparisons for proposition-4

	Top Management*	
	Not Supporting	**Fully Supporting**
Company W	0/6 (0%)	6/6 (100%)
Company S (forced upgrade)	0/6 (0%)	6/6 (100%)
Company T (forced upgrade)	3/8 (40%)	5/8 (60%)
Company R	0/10 (0%)	10/10 (100%)

*Note: x/y represents the ratio and (%) represents the percentage of number of codes for a particular category of top management support over the total number of codes for all categories of top management support, in a company.

the case for top management supports, which fail to prove to be a strong factor influencing ERP upgrade decision (proposition-4).

Based on the pattern-matching of cause-effect relationships tested in this study (as shown in Table 8), it is argued that top management supports are necessary for making an ERP upgrade decision but not a sufficient factor to justify for an ERP upgrade, when there are lack of strategic business benefit incentives and similarity between a firm and a new ERP system business processes. This also indicates that ERP upgrade decisions are made rationally rather than habitually and socially defined. These empirical substantiations help us to refine our initial set of propositions in Table 2, and the modified propositions are as shown in Table 9.

Table 8. Pattern-matching of cause-effect relationships tested in this study

	Perceived Strategic Incentive ≥ 33%*	**"Positive" Symbol Attached ≥ 60%****	**"Almost the Same and the Same" Similarity ≥ 80%*****	**Full Top Management Support ≥ 80%********
Company W	✓	✓	✓	✓
Company S (forced upgrade)		✓		✓
Company T (forced upgrade)		✓		
Company R	✓	✓	✓	✓

* The percentage of perceived strategic business benefit incentive is equal to or larger than one-third (33%) of the total number of codes for all categories of incentives identified in each individual case company.

** The percentage of "positive" symbols is equal to or larger than 60% of the total number of codes for both categories of symbol identified in each individual case company.

*** The similarity between a firm and a new ERP system business processes – is belonging to the categories of "the same" or "almost the same" and its number of codes is equal to or larger than 80% of the total number of codes.

**** The percentage of "full top management support" is equal to or larger than 80% of the total number of codes for all categories of top management support identified in each individual case company.

Table 9. Refined theoretical propositions from this study

	Description
Proposition-1:	Strategic business benefit incentives have strong positive impacts on making an ERP upgrade decision willingly.
Proposition-2:	Symbols attached to an ERP system do not have strong positive impacts on making an ERP upgrade decision willingly.
Proposition-3:	The similarity between a firm and a new ERP system business processes has a strong positive impact on making an ERP upgrade decision willingly.
Proposition-4:	Top management supports are necessary but not a sufficient factor to justify for an ERP upgrade.

FUTURE RESEARCH DIRECTIONS

For future study, researchers can further improve the revised ERP upgrade propositions, as given in Table 9, by testing the propositions using survey research method, and examining if any other existing theories can be used or extended to explain the ERP upgrade decision.

Although this study finds that top management supports are not sufficient factor to justify for an ERP upgrade, it would be interesting to investigate whether different types of leadership style play a moderator role in influencing an upgrade decision, cf. (Rezvani, Dong, & Khosravi, 2017).

CONCLUSION

This study attempts to follow the rigor of positivist case study suggested by Dubé and Paré (2003) as far as possible in order to ensure validity and reliability of this study. This study provides a better understanding of ERP upgrade decision related best practices for practitioners. In particular, this study tells about when and what factors to consider in making a well-informed ERP upgrade decision, to improve the overall ERP upgrade success.

As for managerial implication, this study indicates that aligning more strategic business benefit incentives to an ERP upgrade are likely to gain more supports for the upgrade decision. Some of the latest strategic business benefit incentives may include linking organizational innovations such as cloud and mobile applications to enterprise systems (Sedera, Lokuge, Grover, Sarker, & Sarker, 2016), the use of big data analytics for analysing internal data (from ERP system) and external data for organizational performance evaluation and managerial decision-making (Appelbaum, Kogan, Vasarhelyi, & Yan, 2017), and integrating industrial internet of things (IoT) automation with ERP system to achieve better organizational agility and customer-demand responsiveness (Lavi, 2017).

The research contributions of this study are: (1) the findings here can function as a basis where one can build a stronger theory for ERP upgrade decision; and (2) it provides a support that the contingency factor (i.e. internal resource availability) considered in Khoo and Robey (2007) can be extended to include (i) vendor support termination, (ii) conformity to international standard, and (iii) the need for an upgrade.

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KEY TERMS AND DEFINITIONS

ERP Upgrade Decision: A decision related to replacing an existing installed enterprise resource planning (ERP) system with a newer version of the software, which is purchased either from the same or a different software vendor.

ERP Upgrade Incentives: The motivations behind an ERP upgrade decision. It is usually evaluated and measured based on the business benefits created by upgrading to a new ERP software. These business benefits can be usually categorized into strategic, managerial, and operational business benefits.

Managerial Business Benefits: The type of business benefits that can enhance an organization's business activities management, planning and controlling, business performance monitoring, capability in making a well-informed decision, and compliance to the business regulations.

Operational Business Benefits: The type of business benefits that can improve the effectiveness and efficiency in an organization's daily business operations. For example, a faster order fulfilment cycle, a real-time stock replenishment, and a better customer service provision.

Similarity Between Two Business Processes: The degree of alikeness between two business processes.

Strategic Business Benefits: The type of business benefits that can bring sustainable competitive advantages and bring in revenues to an organization, in the long run or in a few years from now. They are related to the future business and market share expansion, for example, creating an innovative way of doing business, innovations in new product/service, and developing new customer segments or market.

Symbol Attached to an ERP System: It is the perceptions, images, icons, signs, representations, or characteristics that one associates with an ERP system before or after using an ERP system. This symbol is either formed through a social setting/environment (i.e., influenced by other's opinions) or created through one's personal/own experience with an ERP system.

Top Management Support: An organization's senior-level executives backing, encouragement, and provision for various types of assistance and resources needed for a project implementation, such as an ERP upgrade project.

ENDNOTE

1. This paper is a major extension of a conference paper, i.e. Ng, C. S.-P., & Wang, E. T. G. (2014), "An Exploratory Study of the Emergent Theory for Enterprise Resource Planning Upgrade Decision," which is presented at the 25th Australasian Conference on Information Systems (ACIS), Auckland, New Zealand. This book chapter consists of around 50% new materials, not published.