2010

Exploring the Path to ERP Implementation Success: In Retrospect after Rollout

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Abstract

Whereas numerous studies have examined critical success factors (CSFs) for Enterprise Resource Planning (ERP) implementation, little work has investigated the underlying causal links in the form of conceptual models. This study develops a casual model for ERP implementation success, using a two-stage approach. In Stage one, 27 online publications on ERP implementation in China were collected, and analyzed based on the grounded theory approach, to identify critical events and activities in the process of ERP implementation. In Stage two, a focus group study was conducted to create paths to ERP implementation success in the form of a conceptual model. The 48 critical factors identified in Stage one were mapped onto goals of ERP implementation, following the soft systems methodology (SSM). The result is a model including five high-order concepts: organizational impact, data quality, Normalization of processes, continuous improvement, and fit between business process and ERP systems.

Keywords: ERP implementation, ERP success model, Grounded theory approach, Soft systems methodology.

1 INTRODUCTION

Once information systems (IS) are rolled out, their implementation process is considered ended. However, the post-implementation stage can be problematic, but it is not covered by methodologies (Wagner & Newell, 2007). In fact, ERP applications are hampered by numerous problems that surface after the rollout, including structural defects that are impossible or infeasible to fix (Markus & Tanis, 2000; Santhanam, Seligman, & Kang, 2007). In this phase, not only early problems but also new errors can arise. If these problems are not resolved, an ERP project may fail (Markus & Tanis, 2000). A recent survey has also identified numerous problems in post-implementation, and 33% of the companies gave up or replaced the original ERP within one to two years (Qiu, 2007).

Although a large number of studies have examined critical success factors (CSFs) for ERP implementation (e.g., García-Sánchez & Pérez-Bernal, 2007; Nah, Zuckweiler & Lau, 2001; Ngai, Law & Wat, 2008; Somers & Nelson, 2001), there exists little research aiming for constructing causal chains of individual CSFs (Akkermans & Helden, 2002; King & Burgess, 2006). As a result, understanding of ERP implementation is still lacking in the extant literature, and unable to provide practitioners "with the tools to enable more effective interventions" (King & Burgess 2006, p. 59). Furthermore, despite calls to study success factors in different stages of ERP implementation (Nah et al. 2001), most of the prior studies examined early project stages from initiation to rollout only, rarely going beyond ERP rollout (Santhanam, et al., 2007).

To address the shortfalls in prior research, this study attempts to develop a casual model for ERP success, based on a two-stage study. First, we identified critical factors based on second-hand data, "authentic accounts" of critical factors after ERP rollout, and used the grounded theory approach in our data analysis. Since the data set consists of description of ERP implementation after rollout, it should be more comprehensive than data collected to the point of rollout only, revealing issues latent before rollout (Markus & Tanis, 2001). Second, a focus group was used to map the critical factors identified in the previous stage to key aspects of ERP success. The soft systems thinking method was used to help develop a causal model, to provide a holistic understanding of ERP implementation. The research questions are (1) what are the critical factors in retrospect after ERP rollout? And (2) what are the logical relationships among the critical factors in shaping implementation success?

The remainder of this paper is organized as follows. Next, a brief literature review is provided. Then, Sections 3 and 4 describe the two stages of research and results, respectively. Section 5 concludes the paper with discussion.

2 BACKGROUND

2.1 Prior Studies of CSFs for ERP Implementation

Numerous prior studies have examined CSFs for ERP implementation. For example, 11 CSFs were identified by Nah et al. (2001), including business process reengineering, change management culture and program, communication, ERP teamwork and composition, and top management support. Another study highlighted 22 CSFs (Somers & Nelson, 2001). It has been noted that the roles of the CFSs tend to be different in various phases (Markus & Tanis, 2000). For example, whereas top management support can have a continuous effect on the whole implementation phase, business process reengineering is just an important factor in the project phase rather than in system selection.

In recent years, many more studies have been conducted in the same vein (e.g., Ehie & Madsen, 2005; Finney & Corbett, 2007; García-Sánchez & Pérez-Bernal, 2007; Ngai et al., 2008). For example, Finney and Corbett (2007) further identified 26 CSFs through a review of 45 prior studies. Despite the recognition that the factors may vary in different phases, prior research has not systematically analyzed any specific phase (e.g., after rollout or post-implementation).

More recently, a comprehensive literature review of CSFs of ERP implementation was conducted by Ngai, et al. with 18 CSFs and more than 80 sub-factors, which were categorized into three groups:

country-related (2 CSFs), vendor-related (1 CSFs), and organization-related (15 CSFs). However, the large number of CSFs are scattered without underlying links.

2.2 Frameworks for ERP Implementation

Although many studies have identified CSFs, they lack guidance for appropriate implementation practice. Based on Somers and Nelson' (2001) work, Akkermans and van Helden (2002) developed a causal model of ERP success or failure, including 10 factors such as clear goals, management of expectations, interdepartmental communication, interdepartmental collaboration, top management support, project champion, project management, vendor support, and project team competence.

Building upon the causal model, King and Burgess (2006) further categorized the 10 factors into three groups in terms of organizational context, supporters, and project organization: The organizational context refers to interdepartmental communications and collaboration; supporters included top management support, vendor support, and project champion; project organization included clear goals, and project management, package selection, project team competence, and management of expectations, achieving a new causal model. A fourth group was added the model, forming a high-level construct, which was interpreted using social capital and social exchange theory. However, the detailed method of model construction is not clear, although this outcome-oriented model is able to provide guidance for practice about how to realize a goal.

In sum, our literature review reveals three gaps in research on CSFs for ERP implementation: (1) most of the prior studies tend to emphasize identification or ranking of CSFs, rather than relationships among the CSFs, (2) there is a lack of appropriate method to construct a comprehensive causal model of CSFs, (3) most of the prior studies focus on CSFs before ERP rollout, neglecting later stages after rollout, leading to a lack of a comprehensive view of the entire cycle of ERP implementation.

3 STAGE 1: BASIC ACTIVITES AND CRITICAL EVENTS

3.1 Methods

This study adopts an explorative qualitative approach to explore and analyze critical activities in the process of ERP implementation. It follows a two-stage approach, which is similar to the method recommended by Akkermans and van Helden (2002), identification and modeling. The identification stage included two steps, (1) published reports and papers related to ERP implementation were collected from the Internet and filtered, representing a qualitative data source, and (2) coding and identifying basic activities and critical events, using the grounded theory approach (GTA) (Glaser & Strauss, 1967; Charmaz, 2006). The GTA is often used to identify useful concepts from qualitative data. It views the inductive process as a primary method, which often appears in social sciences such as organizational behavior research (e.g., Michel, 2007) and IS research (e.g., Orlikowski, 1993). It is an effective method to explore possible in-depth concepts in the process of ERP implementation in the first stage. The identification will be described in this section, whereas the modeling stage will be discussed in the next one.

3.1.1 Data Collection

Since ERP implementation is often fraught with problems, it is not easy to directly collect real data and information from real-life contexts (e.g., in-depth interview). This situation is particularly prevalent in China's context, as Chinese managers tend to view information of ERP implementation as their own (Ngai et al., 2008). Furthermore, in general managers would like to report good news through formal channels, rather than acknowledge failures or report negative information. However, it is easier to acquire real-life information via some informal channels. According to Shang and Seddon (2002), collecting second-hand data from the Internet has several advantages. The data are easily available, comprehensive, and the cases cover almost all modules of ERP, in multiple industries and companies of various sizes, as recommended by Liu and Seddon (2009).

Since the adoption of ERP by companies in China is much later than western firms, and reports and papers are published at a later period following the actual use of ERP, out data collection was conducted in the following manner: (1) Google search was performed with the term “after ERP rollout” in “the title of the page”; and (2) the search canvassed a three-year period from 2007 to 2009 inclusively. This process yielded 62 papers, which were then manually perused to ascertain and exclude any duplication or similar papers. Those focusing on before rollout were also excluded. As a result, only 27 papers left (43.5%), 26 of them described problems and countermeasures in the process, and one described a straightforward success. Out of the 27 papers, 16 were written from the CIO’s perspective and 11 were the consultants’. Only in 6 papers did the authors reveal their identity, and the rest were anonymous. Therefore, these were considered “authentic account” of ERP projects.

3.1.2 Data Analysis

The study drew upon the GTA to analyze the 27 papers and explore the underlying issues after ERP rollout. The primary research process comprised of the following steps: (1) classifying these papers into three different periods using a qualitative study tool (NVivo 8); (2) perusing these papers, to achieve initial coding according to segment coding and incident coding, followed by attempts to choose terms that stood out (e.g., “*maintenance and support* are not enough”, “there are situations of *misalignment between system configuration and business*”, “*business departments wouldn’t like to use it*”); We conducted incidents coding and segment coding in each paper. Some concepts were scattered in many paragraphs in some papers, whereas in other cases, each paragraph just focused on discussing one subject or a theme. Therefore, we identified subjects based on our further analysis and confirmation that a paper really discussed the subject, instead of depending on their frequency of appearance in a paper. Through this method, we identified the subjects, and counted how many papers mentioned each subject, as the frequency of reference to these subjects. And (3) the authors discussed these basic coding, combining terms of similar meaning to make a single term.

For example, “*product support capability*” is a code resulted from a statement in Paper 3: “*strong capability of supporting products and better system infrastructure are in favor of… this makes it convenient for outside interface programs… and interface management is critical*”. “*Support business*” is a code identified from a statement in Paper 6: *“the system can speed up and simplify month-end financial transactions, and improve finance management capacity*”. We consider that “*product support capacity*” and “*support business”* belong to functional characteristics of the ERP system itself. As a result, we used “product function” to replace the two codes.

3.2 Results

Table 1 shows the 48 subjects of critical factors, and the percentages of reference by the set of papers. As shown in Table 2, 28 of these factors contribute to 11 of the 18 factors identified by Ngai et al. (2008), but the remaining 20 factors represented different things. Many subjects such as “Maintenance and support”, “System use”, “Continuous improvement”, “Rules of process management ”, “Users’ resistance to use”, “User satisfaction” act which were covered by prior studies, although they did not appear in Ngai et al.’s work. These subjects reflected characteristics of problems after ERP rollout. For example, “Maintenance and support” refers to the degree of which relative persons should continue to provide maintenance of ERP to support normal operations; “Users’ resistance to use” refers to some existing problems which users would not like to use new ERP after rollout, which need to be solved.

ID	Subject	No. of papers		ID	Subject	No. of papers	
1	Maintenance and support	21	78%	25	IT staffs' understanding of business	3	11%
2	System use	18	67%	26	Configuration management	2	7%
3	Fit between processes and system	18	67%	27	Interface management	2	7%
4	Continuous improvement	17	63%	28	System function	2	7%
5	Rules of operation	16	59%	29	System architecture	2	7%
6	Data accuracy	14	52%	30	Business continuity	2	7%
7	Change in business process	13	48%	31	Data security	2	7%
8	System stability	11	41%	32	Parallel operation	2	7%
9	Users' resistance to use	11	41%	33	Reports	2	7%
10	Top management understanding of system	10	37%	34	Analysis function	2	7%
11	Normalization of processes	9	33%	35	Trust in consultants	2	7%
12	Continuous evaluation	9	33%	36	Relationship with consultants	2	7%
13	Rules of process management	7	26%	37	Contract management	2	7%
14	Top management support	7	26%	38	Ease of operation	2	7%
15	User satisfaction	6	22%	39	System administration	1	4%
16	Efficiency of use	4	15%	40	Management system development	1	4%
17	Relationship between IT and business unit	4	15%	41	System errors	1	4%
18	Users' understanding of new processes	4	15%	42	System efficiency	1	4%
19	Knowledge transfer	4	15%	43	Convenience of management	1	4%
20	Additional investment	3	11%	44	Proficiency of system use	1	4%
21	Understanding of ERP life cycle	3	11%	45	Support from business units	1	4%
22	Reward for IT staff	3	11%	46	Users' resistant to system modification	1	4%
23	Brain drain	3	11%	47	System bugs	1	4%
24	Benefits from ERP	3	11%	48	IT team development	1	4%

Table 1. Subjects identified from critical events and activities

Ngai et al.'s (2008) Factors	Subject (ID)	Ngai et al.'s (2008) Factors	Subject (ID)
Appropriate business and IT legacy systems	8, 28,29,42	Organizational characteristics	N/A
Business plan/vision/goals/justification		Project champion	
Business process reengineering	7, 11	Project management	
Change management culture and program	7	Software development, testing, and troubleshooting	41, 47
Communication	17	Top management support	10, 14
Data management	6, 31	Fit between ERP and business	3
ERP strategy and implementation methodology		ERP vendor	35, 36, 37
ERP teamwork and composition	23	National culture	N/A
Monitoring and evaluation of performance	12	Country-related functional requirements	N/A

Table 2. Mapped factors into Ngai et al.' (2008) factors from 48 subjects

In short, the results of this study are more holistic than prior studies of CSFs, which cover not only most of general CSFs of implementation, but also emphasize some factors and problems in the stage after ERP rollout.

4 STAGE 2: PATHS TO ERP IMPLEMENTATION SUCCESS

4.1 Methods

The soft systems methodology (SSM) is more suitable than GTA (Checkland & Scholes, 1990; Durant-Law, 2005) for constructing cause-effect model in the second stage. SSM applies to problems of complexity that are not well defined, and to understand the fuzzy world of complex organizations. It is further characterized by attempting to see a system from as many perspectives as possible, and through the eyes of others rather than the researcher (Durant-Law, 2005). That is, when a task/goal needs to be finished, different participants have a systematic understanding of the whole activity through analyzing the logical relationship among sub-tasks and sub-activities. Furthermore, Gregory (1993) specified SSM and provided a cause-effect method to construct conceptual models, that is, participants analyze necessary and sufficient conditions after a goal has been confirmed. These conditions are then resolved into detailed activities until these activities could be fallen into place, leading to an effective cause-effect model.

SSM is flexible, as a study can commence at any stage, with iteration and backtracking as essential components (Maqssod, Finegan & Walker, 2001). Therefore, GTA and SSM combined, being an integrated approach (Durant-Law, 2005), is drawn upon to deconstruct the process of ERP implementation, and to enrich understanding of implementation success in this paper.

Case background ABC Company (real name disguised) is one of the largest coal producers in the world, whose business areas spans from manufacturing to logistics and sales. It has experienced ERP implementations twice. The first time was from July 2003 to May 2004, but it failed to rollout. The company re-organized ERP implementation from June 2004 to April 2005, which was successful. The ERP systems included the FI/CO (Financial module/Cost module), eHR (human resource management module), MM (Material Management module), and interfaces with other systems. The implementation covered more than 30 subsidiaries, which included the manufacture industry, logistics management industry, and service industry.

Informants As SSM thinking suggests, the path of realizing implementation success after beginning ERP rollout, is from different participants' perspectives. Six key participants are chosen for the focus group. Four of them were staff of ABC Company, one was the Manager of IS department, who was the manager of the ERP project; two of them were key users; the remaining one was the project manager of a subsidiary, who took part in the whole process of ERP implementation. Two of them came from the vendor, including the project manager and one senior consultant. Since ABC Company has experienced implementations twice: one failure and another success, these participants were able to clearly identify existing problems and generate useful ideas.

Procedures According to the procedure of SSM, a group discussed original expected goals and existing problems in the process of ERP implementation. A real-life situation of implementation was demonstrated illustrating relevant concepts in dealing with problems, the process, and opinions of cognitions. This group conducted two iterative processes, developing conceptual models, including a high-order conceptual model and a detailed conceptual model.

Before the discussion, the aim of the research and the 48 concepts discussed earlier were sent to every participant to enable them to have a wide understanding of this discussion and be prepared for reviewing relevant original documents. After one week, formal discussion presided by the first author through MSN video group (a communication tools by internet). At the same time, the four staff of ABC Company collected in a small room, facilitated by real-time communication, and the consultant took part in the discussion through the internet.

The discussion essentially was to conceptualize the implementation process. Before the discussion, the group had a rich understanding of 48 concepts identified in the first stage, which was aimed to enable members of the group to have the same language of communication. Then ERP implementation success was decomposed step by step gradually. Firstly, a critical concept (or key goal or objective) was identified for the ERP, and then necessary conditions of it were revealed, and responsible individuals (or business units) were found. Four top level necessary conditions were identified, along with a high-order conceptual model. Second, following the above procedure, each of the four necessary conditions was viewed as a goal separately; a related network of necessary conditions was explored. In these procedures, all participants were asked to attempt to use the 48 concepts provided by the first stage, and they were not permitted to use other terms unless the conditions could not be described with the 48 concepts. Lastly, a conceptual model of ERP implementation success was developed.

Based on the SSM, each goal after ERP rollout was viewed as an issue situation, and the basic activities and critical events identified in the first stage research were considered as root definitions to analyze and decompose the path of realizing the goal. The conceptual model of achieving implementation success after ERP rollout was constructed further.

4.2 Analysis and Results

4.2.1 Constructing High-Order Conceptual Model

As discussed earlier, ERP implementation is a complex project. As such, decomposing the paths to implementation success always involves many facets, such as in the following stages of SSM: (1) based on the goals of ERP implementation, the group discussed the organizational general goals after ERP rollout, achieving a goal that is the first high-order concept: *organizational good impact*; and (2) critical activities, that is, the reason responsible for the activity and finding the necessary conditions which are deemed sufficient in realizing the goal. As a result, we derived the original high-order conceptual model as a result of former method.

Although the aim of adopting ERP is to produce a competitive advantage and improve financial performance, it always lags behind the process of the ERP implementation (Lu & Wang, 1997). Therefore, the group viewed *an expected organizational impact* as the goal of this ERP implementation, which is based on the goal's four necessary conditions: data quality, fit between business and system, normalization of processes, and continues improvement**.**

These four concepts ensure a strong organizational impact together. *Data quality* reflects the nature of system, as good quality data is the precondition of ERP use, and of producing organizational impact; *Fit between business and system* reflects the degree of technology-task fit. If the fit between IT and organizational business is low, the ERP system can be an obstacle for operation, producing negative organizational impact (Wei, Wang & Ju, 2005); *Normalization of processes* reflects the role of ERP in regulating business processes. In Chinese firms, a requirement of adopting ERP is regulating business transactions, because the existing degree of regulation is often too low, which also makes it hard to effectively implement ERP; *Continues improvement* ensures that ERP positively influences the organization, in correspondence with the requirement of dynamic organizational circumstances and the nature of innovation of ERP.

We further deconstructed each concept after having finished the high-order conceptual model, and the tasks were explored by the relevant persons who were responsible for the four earlier concepts. Here an example of *data quality* is taken: Since end-users and the IT department played critical roles in realizing data quality, the group suggested that necessary conditions of data quality were *use* and *system quality* through iterative discussions. *Use* refers to end-users and should use the ERP system, further proper use is a critical condition of achieving data quality. Likewise, if IT department or project team have not provided an ERP application and suitable configuration, it is impossible to achieve good data quality. Following these ideas, we further decomposed the *data quality* construct, achieving the secondary path and the conceptual model. As a result, a detailed conceptual model was developed as shown in Figure 2.

Goal/Condition	High-order concept	Description	Responsible entity
Goal	Organizational impact	After ERP rollout, the system produces positive organizational impact.	Organization
Necessary conditions	Data quality	The quality of data flow and information flow.	Users, IT department
	Normalization of processes	The degree of regulating business processes: in China, organization practices tend to change because of human factor and individuals, thus organizations should institutionalize management goals while making decision of adopting ERP.	Business units
	Fit between business and system	The degree of business process expected matching with system configuration.	Business units / IT department
	Continuous improvement	Including two facets: there exist errors and shortcomings before ERP rollout; improvement of system after ERP rollout.	Business units / IT department

Table 3. High-order concepts

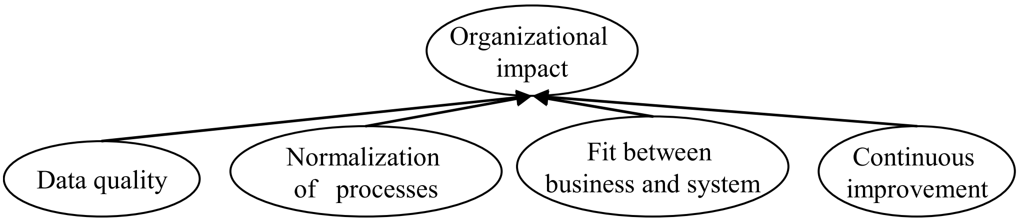

Figure 1. High-order conceptual model

4.2.2 Detailed Conceptual Model

Figure 2 demonstrates paths to implementation success in the form of a high-order conceptual model. It consists of five sub-paths: A Net, B Net, C Net, D Net, and E Net, in which A Net reflects knowledge transformation and shared understanding of ERP system, B Net reflects normal operation and maintenance, C Net reflects the content of organizational impact, D Net reflects use, and E Net reflects ERP systems itself and data quality (e Net specifies E Net). Each of these five parts specifies the high-order concepts as a result of backtracking necessary conditions of realizing each high-order concept.

For example, *continuous improvement* results from two necessary conditions: “7” (change business processes) conducted by the business units, and “12” (continuous evaluation) engaged by the project evaluation team, as continuous improvement must be based on changing the original business process and going on evaluating the ERP system. *Normalization of processes process* results from instituting “13” (rules of process management) engaged by business units. In B Net, “13” and “14” (top management support) are key nodes, whose outputs influence “4” (continuous improvement) and “11” (Normalization of processes) through different paths, respectively. Also, the note, “14” (top management support), indirectly influences other activities within the B net respectively.

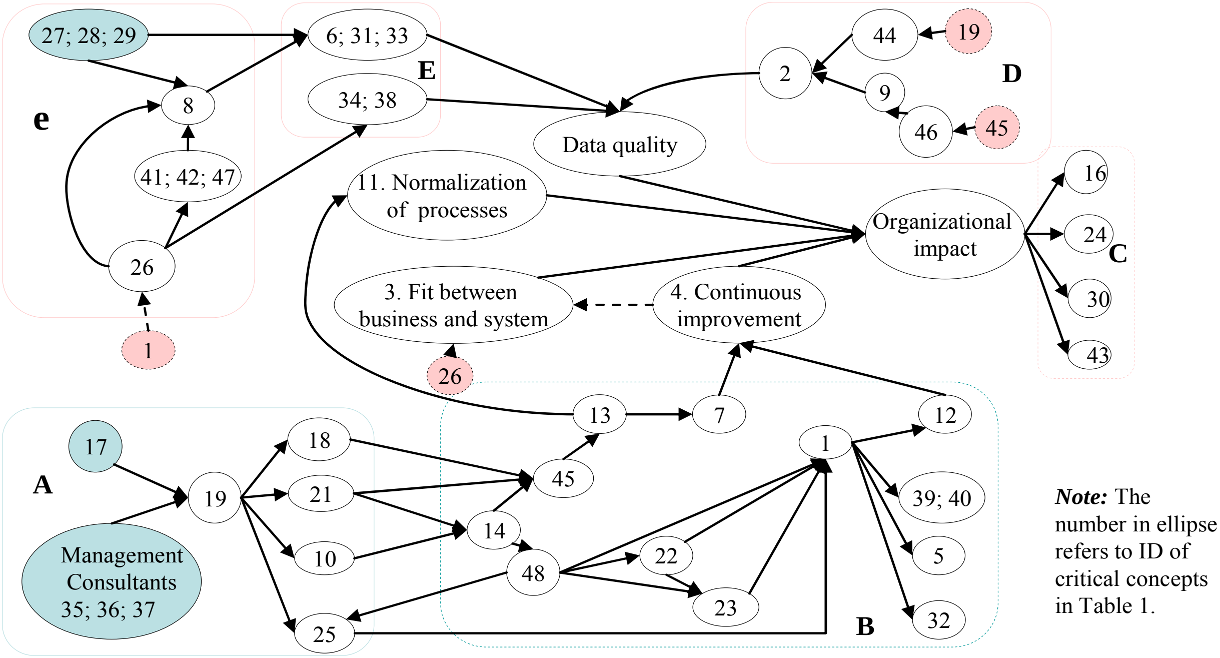

Figure 2. The path to ERP implementation success

In A Net, there is no path directly influencing the high-order concepts in Figure 1, but there are ones directly influence B Net and D Net. Moreover, A Net includes two notes without inputs: "17" (relationship between IT and business units" and management about consultants ("35", "36" and "37"). These two concepts are viewed as preconditions, which have not had the path provided for and also the detailed decomposition of the two notes. They influence "19" (knowledge transfer), which enables the business units and users to understand new business processes ("18"), top managers to understand ERP system ("10"), IT employees to understand the business ("25"), and the organization to understand the life cycle of ERP ("21"), which can promote not only the business units' support but also top management support in B Net. Likewise, we found that "25" (IT staffs' understanding of business) results from two preconditions: "19" (knowledge transfer) in A net and "48" (IT team development) in B Net.

C Net comprises a high-order concept: "Organizational impact" means that implementation success can improve efficiency of use ("16"), enhance business continuity ("30"), Convenience of management ("43"), and deliver benefits ("24").

Furthermore, "data quality" as a high-order concept results from two necessary conditions: D Net and E net in which D Net reflects use. In fact, beginning ERP use implies changing the existing system, which often leads to users' resistance of change ("46"), and resistance to using the new system ("9"). Therefore, an organization has to eliminate this resistance to improve the system use ("2"). Another facilitating factor of system use is the degree in which users are familiar with the ERP system ("44"). Moreover, system use assumes two preconditions: system support efficiency and correction of use. For example, "19" (knowledge transfer) within D Net is a measure of improving the degree of user proficiency, and "45" (Support from business units) is a measure of eliminating the users' resistance to change.

E Net comprises two concepts: the one reflects the dimension of data quality ("6", "31" and "33"), and the other refers to the dimension of the characteristics of system function ("34" and "38"). These two concepts are necessary conditions for realizing the high-order concept "data quality". However, achieving these two goals is based on "26" (configuration management) and system function ("27", "28", and "29") within the e Net, wherein system function is changeable and is limited by the ERP software package chosen by firms, and system configuration reflects the level of system maintenance/support within B net.

It is noted that "3" (fit between business and system) as a high-order concept has no specific sub-path, but results from two preconditions: “11” (continuous evaluation) and “26” (configuration management) within e Net. This will be interpreted in the next section.

5 CONCLUSIONS AND DISCUSSION

5.1 Key Findings

This study has resulted in several key findings. First, there are many critical factors (activities or events) that influence implementation after ERP rollout. Whereas most of them come from the pre-implementation phase, and others are new problems after ERP rollout. For example, “maintenance and support” refers to the degree of which maintenance must be provided for ERP after rollout (Wagner & Newell, 2007). Second and more importantly, there exist distinct logic relationships among these factors. For example, data quality, normalization of processes, continuous improvement, and fit between business process and ERP systems collectively influence organizational impact, although continuous improvement also influences the fit between business and systems. In those causal linkages, some factors look more critical than others. For example, “19” (knowledge transfer) and “10” (top management understanding of IS) indirectly influence other five nets (Akkermans & Heldden, 2002), and “1” (maintenance and support) also indirectly influences continuous improvement, data quality, and the fit between business and system after ERP rollout.

5.2 Implications

Whereas critical factors identified by prior studies mainly focused on pre-implementation, neglecting post-implementation, results of this study are more holistic, which not only cover most of general CSFs of implementation, but also emphasize factors specific to the stage after ERP rollout. Moreover, this study enriches CSFs theory in the following way. Since prior research viewed CSFs as more or less static factors leading to different lists of CFSs in different contexts, neglecting the interaction among of CSFs (e.g., Finney & Corbett, 2007; Nah et al., 2001), which does not facilitate future research. However, this study integrates basic concepts and high-order concepts into a comprehensive IS nomological net, capturing a framework of factors, which rectifies the shortcomings of prior study.

In addition, the combination of SSM and GTA was used to analyze data and construct theory. It seems advantageous for not only exploring fuzzy questions and exploring in-depth information using GTA, but also generating conceptual models. The two methodologies complement each other in reaching the research goals.

Furthermore, compared to this study, the causal models by Akkermans and van Helden (2002), and King and Burgess (2006) are relatively abstract for guiding implementation practices, and lack of specific situations of use, because they just cited the “top 10” CSFs of Somers and Nelson’ (2001) to construct their model. Our conceptual model including high-order concepts helps researchers and practitioners enrich their understanding of the interactive roles among the factors.

This study also provides a tool for evaluating ERP implementation. More specially, the 48 subjects and concepts can be viewed as indicators of successful ERP implementation. The comprehensive set of paths to ERP implementation success provides guidance to not only how to support and maintain the normal operation of ERP system but also how to improve each stages of ERP implementation. The relationships among critical activities and events can effectively guide how to institutionalize and choose measure of ERP implementation, and enable organizations to increase understanding of cause-effect relationships among those activities, resulting in more effective policies.

5.3 Limitations

Although Checkland (1995) suggested that to test the validity of a model is not easy, he provided a basic thinking to identify which model is better or worse the process of developing suitable models, and whether they are in any sense relevant. The degree of which this development is suitable depends on whether identifying basic concepts, the root definitions, and modeling concepts systematically draws upon a complete data source. Also, the degree of the relevance of the models depends on participants who took part in developing the models, and whether the models generated enrich understanding of ERP implementation (Warwick, 2008).

In light of the above discussion, the limitation of the study results from the earlier 48 basic concepts, which was investigated through the data source from the Internet. This second-hand data may lack validity. However, the 27 papers published on the internet are a comprehensive sample about ERP rollout, capturing overall critical concepts.

In the second stage research, the limitations result from several facets, as follows. First, only a limited number of employees were chosen to engage in the discussion, which could lead to incomplete understanding of ERP implementation. Second, in the discussion, 48 concepts were provided from the outcome of the first stage for the group, which might have biased the group members in leading them to focus on the 48 concepts while neglecting other critical activities and events.

Lastly, when the basic concepts were extracted based on the investigation after ERP rollout, some activities could have been omitted, such as system selection in the initial stage of ERP implementation. This is a future research opportunity, which should investigate long-term ERP implementation processes to supplement and improve the models.

Acknowledgements: The authors would like to thank the three anonymous reviewers for their insightful and helpful comments. This research is supported by the national Natural Science Foundation of China (Project Number: 70888001).

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