Understanding the phenomenon of IS success in China through the lens of the IS-Impact model

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IS success model, IS-Impact measurement model, China, Enterprise systems, qualitative research, inductive enquiry approach, multidimensional construct
Executive Abstract

This study is conducted within the IS-Impact Research Track at Queensland University of Technology (QUT). The goal of the IS-Impact Track is, “to develop the most widely employed model for benchmarking information systems in organizations for the joint benefit of both research and practice” (Gable et al, 2006). IS-Impact is defined as “a measure at a point in time, of the stream of net benefits from the IS, to date and anticipated, as perceived by all key-user-groups” (Gable Sedera and Chan, 2008). Track efforts have yielded the bicameral IS-Impact measurement model; the “impact” half includes Organizational-Impact and Individual-Impact dimensions; the “quality” half includes System-Quality and Information-Quality dimensions. The IS-Impact model, by design, is intended to be robust, simple and generalizable, to yield results that are comparable across time, stakeholders, different systems and system contexts. The model and measurement approach employ perceptual measures and an instrument that is relevant to key stakeholder groups, thereby enabling the combination or comparison of stakeholder perspectives. Such a validated and widely accepted IS-Impact measurement model has both academic and practical value. It facilitates systematic operationalization of a main dependent variable in research (IS-Impact), which can also serve as an important independent variable. For IS management practice it provides a means to benchmark and track the performance of information systems in use.

The objective of this study is to develop a Mandarin version IS-Impact model, encompassing a list of China-specific IS-Impact measures, aiding in a better understanding of the IS-Impact phenomenon in a Chinese organizational context. The IS-Impact model provides a much needed theoretical guidance for this investigation of ES and ES impacts in a Chinese context. The appropriateness and soundness of employing the IS-Impact model as a theoretical foundation are evident: the model originated from a sound theory of IS Success (1992), developed through rigorous validation, and also derived in the context of Enterprise Systems.

Based on the IS-Impact model, this study investigates a number of research questions (RQs). Firstly, the research investigated what essential impacts have been
derived from ES by Chinese users and organizations [RQ1]. Secondly, we investigate which salient quality features of ES are perceived by Chinese users [RQ2]. Thirdly, we seek to answer whether the quality and impacts measures are sufficient to assess ES-success in general [RQ3]. Lastly, the study attempts to address whether the IS-Impact measurement model is appropriate for Chinese organizations in terms of evaluating their ES [RQ4].

An open-ended, qualitative identification survey was employed in the study. A large body of short text data was gathered from 144 Chinese users and 633 valid IS-Impact statements were generated from the data set. A generally inductive approach was applied in the qualitative data analysis. Rigorous qualitative data coding resulted in 50 first-order categories with 6 second-order categories that were grounded from the context of Chinese organization. The six second-order categories are: 1) System Quality; 2) Information Quality; 3) Individual Impacts; 4) Organizational Impacts; 5) User Quality and 6) IS Support Quality.

The final research finding of the study is the contextualized Mandarin version IS-Impact measurement model that includes 38 measures organized into 4 dimensions: System Quality, information Quality, Individual Impacts and Organizational Impacts. The study also proposed two conceptual models to harmonize the IS-Impact model and the two emergent constructs – User Quality and IS Support Quality by drawing on previous IS effectiveness literatures and the Work System theory proposed by Alter (1999) respectively.

The study is significant as it is the first effort that empirically and comprehensively investigates IS-Impact in China. Specifically, the research contributions can be classified into theoretical contributions and practical contributions. From the theoretical perspective, through qualitative evidence, the study test and consolidate IS-Impact measurement model in terms of the quality of robustness, completeness and generalizability. The unconventional research design exhibits creativity of the study. The theoretical model does not work as a top-down a priori seeking for evidence demonstrating its credibility; rather, the study allows a competitive model to emerge from the bottom-up and open-coding analysis. Besides, the study is an example extending and localizing pre-existing theory developed in Western context.
when the theory is introduced to a different context. On the other hand, from the practical perspective, it is first time to introduce prominent research findings in the field of IS Success to Chinese academia and practitioner. This study provides a guideline for Chinese organizations to assess their Enterprise System, and leveraging IT investment in the future. As a research effort in ITPS track, this study contributes the research team with an alternative operationalization of the dependent variable. The future research can take on the contextualized Mandarin version IS-Impact framework as a theoretical a priori model, further quantitative and empirical testing its validity.
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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Signature:  ___ Lan Cao ___

Date:      __ 2010-10-30 __________
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Chapter 1  Introduction

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1.1 Research Background and motivation

In the past two decades, Chinese companies have faced tougher competitive challenges than many of their western counterparts due to a radical change in their internal and external environment (Ma and Loeh 2007). In response to this fierce domestic and international competition, Chinese managers has increasingly started to look towards Information Technology (IT) applications as part of a business-wide modernization of their processes and management models (Reimers 2003; Woo 2007). Sophisticated, off-the-shelf Enterprise Systems (ES) have in particular received much attention from Chinese managers, as they proceed to embrace many concepts of ES, such as Enterprise Resource Planning (ERP) systems, Supply Chain Management (SCM) systems and Customer Relationship Management (CRM) systems. A large number of ES implementation projects have been initiated by Chinese managers, in order to facilitate organizational, strategic and structural innovations, to comply with international standards, and to ultimately gain a strategic edge in global competition.

Over the last decade, China’s enterprise system market has experienced rapid growth. Currently, China is the second-largest software market in the Asia/Pacific region, accounting for 19% of the regional market in 2005. According to the China Centre for Information Industry Development (CCID 2007), in 2006, China’s management software market was worth 7,136 million Yuan (1 USD$ ≈ 6.8Yuan), up 19.5% from 2005 (CCID 2007). Moreover, according to an annual report on the management software market in the Asia/Pacific region released by the Gartner Group (2006), China’s software industry will enjoy an 18.5% compound annual growth rate from 2005 to 2010 and is ranked as the most rapidly growing market in the world.

Though Chinese organizations are increasingly dependent on their installed base of ES, much dissatisfaction with ES has been reported; many ES implementation projects are not completed on time or within budget, and many fail to meet requirements and realise promised benefits (Zhang, Lee et al. 2002; He 2004; Martinsons 2004; Xue, Liang et al. 2005). Statistics show that the ERP success rate in China is rather poor (Xue, Liang et al. 2005), which is much lower than the
western counterparts. In these circumstances, it is important that Chinese organizations monitor the success of their growing investment in ES. It is also important that academia deliver applicable and relevant research to help Chinese practitioners to better leverage their ES investments.

Our literature review revealed the disappointing state of Chinese ES success research. As Chinese organizations continue to acquire ES, it is understandable that much of the extant literature on ES in the region of Greater China\(^1\) deals with issues related to implementation critical success factors and implementation methodologies. The literature review also indicated that research on success evaluations of such systems at later stages in the acquisition process (post-implementation) is sparsely represented. Nonetheless, when Information Systems (IS) investments in China are evaluated post-implementation (which is atypical), the review process tends to be idiosyncratic and lacking credibility or comparability.

Somers, Nelson et al. (2003) and Ifinedo and Nahar (2007) called on researchers to contribute to ES studies of the later stages in the life-cycle of ES, as the body of knowledge on ES is growing and accumulating. In this study, the researcher looks beyond the issues related to implementation and adoption of ES. Specifically, this study focuses on the evaluation of Enterprise Systems success in the post-implementation stage in Chinese organizations.

The study is also motivated by a concern not to overlook the influences of context-specific issues when evaluating an ES in a particular context. Tornatzky and Fleischer (1990) argue that an environment or context shapes the diffusion of technology innovations. (DeLone and McLean 1992; Sanders and Garrity 1996; Myers 1997) suggest that research into IS assessment should take into account the individual characteristics of the system under study and the contingent factors influencing such individual characteristics; further cautioning against underemphasizing the relevance of contextual or contingency factors. This study

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\(^1\) Greater China (simplified Chinese: 大中华地区; traditional Chinese: 大中華地區; pinyin: Dà Zhōnghuá Dìqū) is a term that refers to commercial ties, cultural interactions, and prospects for political unification among ethnic Chinese (Wikipedia 2010). In this study, usage of the term Greater China pertains to mainland China, Hong Kong, Macau, and Taiwan. Usage of the term 'China' only pertains to mainland China.
investigates and discusses the evaluation of ES in the Chinese context; it hopes that our efforts will yield a deeper understanding of China’s ES and ES evaluation for both practitioners and academia.

The researcher endeavours to ground an IS evaluation model in the Chinese business context. The proposed model incorporates the salient dimensions and measures of effectiveness of ES with consideration of contextual factors, from the perspective of practicing Chinese ES users. This study is part of the research efforts of the IT Professional Services (ITPS) Research Program, Queensland University of Technology (QUT), which is committed to develop the most validated, economical and generalizable IS success model, instrument and approach, designed both for research purposes and for benchmarking IS in practice. This study builds upon the prior research outcomes of the ITPS program, specifically, the IS-Impact measurement model (Gable, Sedera et al. 2008).

The study differentiates itself from other IS success evaluation studies through the adoption of an inductive inquiry approach. The literature review indicates that most researchers employ a top-down, deductive approach to extend, validate and modify extant research models in the IS success evaluation area. For example, (Sedera 2005; Gable, Sedera et al. 2008) extended the earlier IS Success model (DeLone and McLean 1992) to the context of contemporary IS, developing the IS-Impact measurement model. Based on the early version of the IS-Impact model (Sedera, Gable et al. 2003), Ifinedo and Nahar (2007) extended the model to the context of Northern European countries, modifying the theoretical model with two new dimensions.

This study attempts to experiment with an innovative approach to investigate the IS success evaluation topic. The supervision team in the ITPS program always encourages novice researchers to be creative and proactive, so that the body of knowledge on IS success evaluation can grow, without digressing from what appears to be widely accepted conventions and a safe approach, and not fearing to explore new methods and techniques to challenge conventions in a traditional area. Therefore, the researcher undertakes a bottom-up, data-driven and generally inductive inquiry of the topic of interest. Specifically, rather than imposing the
existing IS-Impact model upon the study context, and taking the extant measures as given, the study commences from the new and unique study context, grounding the most relevant measures and dimensions as identified from the empirical data, engendering a deeper understanding of the IS success evaluation criteria and developing context-specific knowledge of ES in China.

In summary, this study aims to evaluate the impacts of Enterprise Systems (ES), especially packaged Enterprise Systems, such as SAP R/3, for Chinese users and organizations. In line with the addressed study objective, a set of research questions was developed, the research scope was delineated, and an applicable research design was devised. The remaining sections will describe the research questions, scopes and a general introduction of the research design. This chapter will conclude with an outline of the thesis structure.

1.2 Theoretical underpinning and background

Evaluation is a subjective activity. Evaluation measures can encompass different aspects and different perceptions. For example, IT value studies assess IS productivity using a ‘cost-benefit’ approach (Van der Zee 2002). A large number of IS Success studies regard user satisfaction as a surrogate indicator to demonstrate overall effectiveness of an IS (Ives, Olson et al. 1983). Other studies do not focus on IS applications, but rather, are akin to evaluating IS as a project, being measured against factors comprising on-time on-budget, smooth changeover etc.

It is essential to choose a sound theory from those available and to start to explore the topic of interest. As mentioned previously, as a part of the study efforts within the IS-Impact Research Track at Queensland University of Technology, this study begins with the IS-Impact measurement model as the theoretical base. The IS-Impact track goal is to develop the most widely employed model for benchmarking information systems in organizations for the joint benefit of both research and practice. Track efforts have yielded the two-dimensional IS-Impact measurement model, a formative index; as shown in figure 1.1, the impact half measures the net benefit of ES to date, while the quality half is the best proxy for measuring the impacts anticipated. The IS-Impact of an Information System (IS) is
defined as “a measure at a point in time, of the stream of net benefits from the IS, to date and anticipated, as perceived by all key-user-groups” (Gable, Sedera et al. 2008). “The IS-Impact model, by design, is intended to be robust and simple yet generalizable, yielding results that are highly comparable across time, stakeholders, different systems and system contexts. The model and approach employ perceptual measures, aiming to offer a common instrument answerable by all relevant stakeholder groups, thereby enabling the combining or comparison of stakeholder perceptions. Such a validated and widely accepted IS-Impact measurement model has both academic and practical value. It facilitates systematic operationalization of a main dependent variable in research (IS-Impact), which can also serve as an important independent variable given other research questions. For IS management practice it provides a mean to benchmark and track the performance of information systems in use” (Gable, Sedera et al. 2008).

Figure 1.1 The IS-Impact Model

Having adopted the IS-Impact model as foundational theory, the two halves of the IS-Impact point to two areas of inquiry that fundamentally influence the scope and direction of this study. Thus, the study commences the evaluation inquiry of ES in China with emphasis on the quality of the ES artifact and the impacts anticipated and/or realized of the ES. Moreover, these two evaluation areas were coined as main research questions guiding the research focus and effort; they were operationalized in the instrument gathering meaningful data; they also functioned as conceptual umbrellas under which specific categories, success measures and dimensions are grounded empirically and inductively. In summary, this conceptual
model is at the root of the underlying purpose of this study that informs overall research effort.

1.3  Research objectives and research questions

1.3.1 Research objectives

The objective of this study is to develop a Mandarin version of measures and dimensions of the IS-Impact model in the context of Enterprise Systems, in the process yielding a better understanding of the phenomenon of IS success in China; such a model facilitating the assessment of IS success in China. The main research objective entails a set of specific research goals:

1. To develop a contextual understanding of the state of enterprise systems in Chinese organizations.
2. To inventory a set of a Mandarin version of IS-Impact measures and dimensions from Chinese ES end-users.
3. To contextualize the IS-Impact evaluation approach accounting for the Chinese context and fulfilling Chinese ES user requirements.

1.3.2 Research questions

Based on the above research objectives, the study addresses the following research questions. The study design began with a high level research question: How can we measure Information Systems Impacts in the Chinese organizational context? To better address this question, the main research question can be further defined as a series of sub-questions:

1. What salient impacts of Enterprise Systems are perceived by Chinese users?
   – This involves identifying measures of the ‘impact’ half of the Mandarin IS-Impact model

The IS-Impact concept assumes that the information systems is intended to yield a stream of net benefits across its lifetime, and that operationally, it is practical to consider in combination, those benefits realized ‘to-date’ and those future benefits anticipated. The impacts half of the IS-Impact model measures those impacts ‘to date’ (Gable, Sedera et al. 2008).
The impacts can be positive/negative, strategic/operational, namely, any outcome yielded by the interaction between ES and users. The impacts are observed from two analysis levels, including organizations and individual users. However, the impact here is from an organization-centric perspective, even in the individual level; the evaluation is concerned only with system-related benefits for the organization, not with personal interests and benefits.

Therefore, seeking to answer this question, the researcher attempted to identify the essential impacts of an ES, already realized in Chinese organizations. Those important, significant impacts are eligible measures to benchmark the effectiveness of ES in China.

2. What are the salient quality features of Enterprise Systems perceived by Chinese users? – This involves identifying measures of the ‘quality’ half of the Mandarin IS-Impact model

The IS-Impact approach indicates that the quality of a system is as important as the impact of that system already realized. Thus, the other half of the measuring model is to assess the goodness of system design and information output (Gable, Sederer et al. 2008). Hence, this question seeks to understand the technical features of an ES that Chinese users usually emphasized. Those system features that are valued by Chinese users are regarded as eligible measures to benchmark the quality of ES in Chinese organizations.

3. Can those salient ES quality features be regarded as a proxy indicator predicting future net benefit of ES?

The IS-Impact approach proposes that the IS-Impact is a formative multi-dimensional construct. The aggregation of both ‘quality’ and ‘impact’ of a system evaluates the success of such IS application holistically. Nevertheless, the quality of a system, proposed as the best proxy measures, implies the probable future impacts anticipated by users. Thus, this question seeks justifications of the proposal in the context of Chinese organizations. The researcher sought out, besides the quality of the ES application, any supportive or complementary factors facilitating the constant flow of benefit related to Enterprise Systems. In other words, to gain a holistic view of the success of an ES in a Chinese organization,
this study examines whether the evaluator should consider other factors besides the existing IS-Impact dimensions

4. Is the IS-Impact measurement model appropriate for Chinese organizations in terms of evaluating their ES?

Answers to the four questions above will yield an answer to this final question; where the study attempts to assess the generalizability of the IS-Impact measurement model to a new Chinese business context.

1.4 Research scope

Several researchers, e.g. (Seddon, Staples et al. 1999; Shang and Seddon 2002; Sedera 2005) recommend that, before seeking to evaluate an IT investment, it is necessary to clarify answers to seven questions of Cameron and Whetten (1983) on organizational effectiveness measurement. This study does not actually evaluate the ES, but rather to seek criteria for such evaluations. However, clarification on these questions will still aid in crystallizing the scope and objectives of the evaluation criteria study, and then facilitate the overall study design. Table 1.1 summarizes these seven questions and also provides the researcher’s approach with regard to this study.

<table>
<thead>
<tr>
<th>Seven questions for measuring organizational performance</th>
<th>Approach in this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>From whose perspective is effectiveness being judged?</td>
<td>Primarily focus on internal stakeholders: operational end users, and management level users.</td>
</tr>
<tr>
<td>What is the domain of activity?</td>
<td>Enterprise information systems application and associated impact</td>
</tr>
<tr>
<td>What is the level of analysis?</td>
<td>Individual and organization</td>
</tr>
<tr>
<td>What time frame is employed?</td>
<td>Post ES implementation</td>
</tr>
<tr>
<td>What is the purpose of the evaluation?</td>
<td>Managing and improving ES performance and facilitate further</td>
</tr>
</tbody>
</table>
positive impacts

<table>
<thead>
<tr>
<th>What types of data are to be used?</th>
<th>Perceptual measures which derived from qualitative data.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Against which referent is effectiveness to be judged?</td>
<td>Original IS-Impact measurement model</td>
</tr>
</tbody>
</table>

Table 1.1 Seven questions help to scope the study

- Evaluation from whose perspective

This study seeks to understand ES and its impacts from the point of view of Chinese users who directly use ES on a regular basis. The respondents include operational users, front line managers and business managers. Shang and Seddon (2002) argue for the credibility of ‘business managers’ in terms of assessing ES benefits and performance. Since these middle-level managers are process owners of respective business functions, they are responsible for bridging the corporations’ strategy and daily business operations. Because they are positioned in the middle of the enterprise hierarchal pyramid, they may gain a holistic perspective on organizational issues such as ES adoption and impacts. Meanwhile, business managers usually get involved with ES as early as in the implementation stage in China (Xu and Ma 2008; Frank and Rohm 2009); thus they are expected to be able to offer superior insights in terms of system knowledge.

Besides managers, the study also seeks the perspectives of operational users and managers. Although operational users and managers are criticized as ‘taking little accounting of organizational goals’ and ‘perception based on individual needs and interests’ (Shang and Seddon 2002), this study appreciates operational users’ adequate interactions with ES and accepts that they are able to provide acute viewpoints based on regular interaction. Technical and strategy level users’ opinions are also included, in order to present a complete perspective on the IS-Impact of ES in the Chinese context.

- Domain of the evaluation criteria study
The domain of activity delineates the unit-of-analysis of the study. The study focuses on ES applications. Enterprise Systems (ES), whose synonyms are: commercial software package, enterprise wide-systems, enterprise resource planning systems (Rosemann, 1999), are defined as comprehensive package software solutions seeking to integrate the complete range of a business’ processes and functions in order to present a holistic view of the business from a single information and IT architecture (Gable 1998).

ES have unique characteristics that distinguish it from other contemporary IS, conceptually and technically. Firstly, ES is a standard and generic ‘semi-finished’ software package with pre-defined business process flow (Shang and Seddon 2002). The standardization and generalization refer to the so-called ‘best practice’ that are in-built in ES. This feature helps managers to specify, redefine, and standardize original business processes in individual organizations. The ‘semi-finished’ feature points to the rich customizing potential which distinguishes ES from other standard package software (Klaus, Rosemann et al. 2000; Kraemmerand, Moller et al. 2009). ES such as ERP offer a wide range of pre-configured alternatives which allow the application to be adapted to the specific business context.

Comprehensive functionality is another differentiator of ES. The purpose of the most contemporary IS, such as ERP, is to support all business functions of an enterprise in a seamless way. The comprehensive functionality of ES is industry specific and updated continually. These functions provided by an ES embed deep knowledge and comprehensive understanding of an industry sector accumulated by ES vendors (Klaus, Rosemann et al. 2000; Shang and Seddon 2002; Lee and Myers 2009). Finally, ES is characterized by integration. A growing body of literature addresses the issues of integration in many aspects from multiple levels, including: (1) technical (system) integration (Shang and Seddon 2002; Chang and Kettinger 2009), (2) information integration (Davenport 1998; Chang and Kettinger 2009); (3) business (functions) integration (Gagnon and Pinsonneault 2009; Kien and Lian 2009); and (4) Enterprise integration (Kien and Lian 2009).

- Analysis level of the evaluation criteria
The study is interested in ES impacts on both the level of the individual and of the organization. Individual level analysis is around a subject who directly interacts with ES applications and consumes information products. It is beneficial to assess the extent to which they value the ES and benefit from it. Additionally, an overarching analysis is made at the level of organization. As the ultimate goal of an ES investment is to harvest tangible and intangible organizational benefits, the evaluation ought to offer such feedback. Therefore, the analysis of IS-Impact of ES is applied at both levels.

- Time frame of the evaluation criteria study

Evaluation can happen in the overall ES lifecycle. Figure 1.1, adapted from (Sedera 2005), shows the ES-lifecycle phases. This study’s purpose is to assess ES in the years after a system goes live – the stable operational ES at least 2 years after initial implementations.

![Figure 1.2 The ES-lifecycle phases (adapted from (Sedera 2005))](image)

- Purpose of the evaluation criteria study

The post-implementation assessment helps in gauging to-date ES impacts as well as suggesting probable future impacts delivered by ES. Both evaluation results help organizations to yield a constant flow of net benefit across time and functionalities. The goal of the study is to develop an IS-Impact model that will assist in (1) the identification of the various types of impacts, including positive/negative or strategic/transactional effects, as well as (2) identification of system quality
features, including salient features and bottlenecks. The results of evaluation will help Chinese managers to plan, manage and improve ES usage and optimization.

- Data (measure) used in the evaluation criteria study

The benefits/impacts of enterprise systems can be gauged in forms of financial index, quantified operational terms, and perceptual measures. It is noted that substantial efforts have been made to measure IS benefits and value in terms of monetary indicators (DeLone and McLean 1992; Melville, Kraemer et al. 2004; Gable, Sedera et al. 2008). Researchers (Brynjolfsson 1993; Chan 2000) suggest that too much emphasis on financial criteria leads to the issue of the IT Productivity paradox: the contradiction between the remarkable advances in computer power and the relatively slow growth of productivity at the level of the whole economy, individual firms and many specific applications. One reason of the paradox is that ES yield many intangible and indirect benefits that financial measures are not capable of accounting for.

A substitute method accounting for ES benefits/impacts is using measures of perceptions. Perceptual measures investigate the experience, observations, attitude and behaviour of IS users when they interact with IS applications. Furthermore, perceptual measures can examine multiple aspects of IS impacts, such as perceived performance of applications, perceived quality of information products, user satisfaction, perceived usefulness of applications, and net benefits (Shang and Seddon 2002; Ifinedo and Nahar 2007; Wu and Wang 2007; Petter, DeLone et al. 2008). Perceptual measurements provide an economic and efficient tool to benchmark IS benefits/Impacts. In addition, compared with financial measurements, perception measurements provide a common language to communicate results of the ES Impact assessment across business, technical and strategic users.

The purpose of the study is to seek out perceptual measurements based on empirical evidence provided by Chinese ES users. We also argue that perceptual indicators are a useful approach to measure IS-Impacts.

- Judgement reference of the evaluation criteria study
This Mandarin version of the IS-Impact framework is theoretically derived from the IS-Impact research of (Gable, Sedera et al. 2008). It also addresses the specific needs of Chinese practitioners and Chinese ES adopters. The judgement reference employed here is the original IS-Impact findings and IS evaluation framework; through thorough comparisons we are able to assess the usefulness of the new framework.

1.5 Research strategy

This study adopts a qualitative method as the primary research strategy. Qualitative research involves the usage of qualitative data, such as textual data from open-ended survey questions, interviews, archival documents, and/or observation data, with the intention to understand and interpret social phenomena. Interest in conducting qualitative research in the IS discipline is increasing, due to a general shift in IS research away from technological to managerial and organizational issues (Myers 2008).

However, the essential question is whether qualitative methods are applicable to investigate the IS-Impact phenomena in China. Is the qualitative method an effective and useful way to answer research questions and fulfil research objectives? Is the qualitative method able to develop a measurement model that accounts for IS success and impacts?

Qualitative research methods are designed to help researchers to understand people and the social and cultural contexts within which they live and interact (Yin 2003; Myers 2008). Qualitative research methods provide effective approaches for inquiring about complex topics in the IS discipline. The IS discipline is a complex area that entails multiple elements. For example, Benbasat & Zmud (2003) proposed an IS Nomological Net (IS-Net) to prescribe an identity for the field of IS. The IS-Net argued that, although placing the IT artifact as the core, four other high-level concepts, including impacts, use, IT capability and IT practice, also play an important role (at least a supportive role) in IS research. Thus, the IS-Net indicates, in addition to studying IT artifact, that one should focus on how IT artifacts are conceived, how they are being used, supported and evolved, and how
IT artifacts influence the context in which they are embedded. The IT artifact cannot be isolated from its user, task and context.

Specific to IS-Impact studies, the IS-Impact phenomenon is dynamic, complex and multi-dimensional, and may be perceived differently in different scenarios. Nevertheless, there are no commonly agreed evaluation methods for gauging intangible IS or ES impacts. The study attempts to explore a dynamic and complex phenomenon in a new research context where little research has been done. The study also attempted to develop a subjective IS evaluation model that encompasses context-specific measures and fulfil context-specific requirements. In this case, employment of a qualitative research method and triangulated qualitative evidence is appropriate for this exploratory study.

The second part of the research strategy is the employment of a general inductive approach to investigate the topic of interest. The inductive approach refers to approaches that primarily use detailed reading of raw data to derive concepts, themes, or a model; interpretations are made from raw data (Thomas 2006). Consistent with the traditions of Grounded Theory methodology (Glaser and Strauss 1967; Strauss and Corbin 1998), inductive analysis begins with an area of study and allows the theory to emerge from the data. Compared to a deductive inquiry approach that normally aims to test an a-priori theory, the inductive inquiry approach aims to develop the theory from the empirical data. Hence, the inductive approach features as ‘bottom-up’ and ‘data-driven’, making sense of field data (Lincoln and Guba 1985) and managing to arrange the data set into a logical classification (Sedera 2005).

This study is an inductive ES success study, based on qualitative data gathered in open-ended questions, and aims to ground the contextualized ES evaluation criteria assisting in assessment of a particular type of ES in a Chinese context. The primary purpose of this inductive research is to allow subjective evaluation measures and dimensions to emerge from the frequent, dominant, or significant themes inherent in qualitative empirical evidence. The empirical data is gathered from a large number of Chinese ES users in a real Chinese business setting that has adopted ES as its business platform. In line with Thomas’s (2006) general inductive approach,
the evaluation objectives and perspectives will provide a focus and domain of relevance for conducting the inductive analysis. The upper-level concepts, namely the general themes, patterns, or core categories, are likely to be derived from the evaluation aims; the lower-level or specific categories or codes will be formulated from multiple reading, comprehending, and coding empirical data. In conclusion, this analysis is generally inductive but also is led by specific evaluation objectives in terms of the quality of ES artifact and ES impacts.

1.6 Research design

This study focuses on the Chinese organizations that have been through Enterprise information systems implementation and are in the post-implementation stage, in order to understand their experience in realizing IS impacts. The candidate made cautious decisions about the research philosophical stance for this study. I posit this study as a positivist research given the positivism nature of the IS evaluation criteria study and the candidate’s proximate associates with this philosophical traditions in her research team. As summarized in Figure 1.2, to comprehensively explore Chinese IS-Impact phenomena and to address the research qualities of rigor and relevance, the study entails two main phases. The candidate recognizes that both the research objectives and the chosen research philosophical stance help to shape and constitute the research design.
1.6.1 Definition Phase

The first phase is the definition phase, involving four major activities: 1) research strategy exploratory, 2) literature review, and 3) context research.

- **Research strategy exploration**

  The study starts with specification of the research problem and crystallization of the study goals. Research questions are constructed based on proposed study objectives.

- **Literature review**

  This activity produces a comprehensive literature review on IS evaluation and the Enterprise System. References are collected, ranging from English publications to Mandarin IS work presented in prominent Chinese academic outlets. References in terms of research methodology are broadly reviewed, such as qualitative research.
in general, content analysis, grounded theory and case study researches. The aims of the literature review are to have a good understanding of the topic, to identify theory underpinning the study and to accumulate solid knowledge on relevant research streams. Additionally, the literature review assists the researcher to identify research gaps in the previous IS success studies and the IS-Impact measurement model. These gaps help in positioning the proposed study and highlight research opportunities in the IS success area of research.

- **Context study**

This activity is to produce a detailed report on the context of this study of ES application and adoption in China. The purpose of the context report is to explore the context and to aid in understanding and interpreting further study results. The context report investigates the Enterprise Systems Market in China; identifies salient issues in light of ES management and evaluation in Chinese organizations; and tries to understand the motivations for and expectations of ES adoption in Chinese organization. The context report makes three major contributions: it informs the study design, informs the model building, and later, helps in interpreting the results.

### 1.6.2 Model Development

The second phase of the proposed study is the model development phase. Commencing with the IS-Impact measurement model, the study aims to develop a Mandarin version IS-Impact model applicable to the Chinese context. To recognize IS-Impact as a formative construct, it is necessary to emphasize the completeness of the concept domain and to encompass critical composite parts informing the IS-Impact in this context. Thus, a model identification survey is carefully designed, in order to inventory a broad list of perceived IS-Impact measures from Chinese ES users. The model is conceived from the actual experience and observations of real ES application users, rather extended from existing framework and scales. Hence substantial effort is spent analysing and coding textual data from the identification survey. Finally, a large chunk of short textual data is consolidated into an IS-Impact framework according to measurement model development criteria,
namely that it measures completeness, mutual exclusivity and proper hierarchy of measures.

- **Pilot study**

  The pilot study played a critical part in the study. The study intends to conceive a context-specific IS-Impact model inductively and to address a great deal of relevance to Chinese practitioners. The main objective is twofold: (1) to pilot test the feasibility of the survey design and the survey instrument that will be used in formal identification survey; (2) to devise a qualitative data analysis guideline which will inform identification survey data analysis.

- **Identification survey**

  The identification survey is intended to collect salient IS-Impact dimensions and measures from a large sample of respondents in the participant organizations. The survey is exploratory, open-ended and qualitative in nature. The intention is to identify and to learn about IS-Impact from the real field. The model derived in this way will be data-driven and highly relevant to the context. For the importance of textual data quality, the survey will be conducted in Mandarin.

- **Data analysis**

  Several qualitative data analysis strategies have been examined and compared before scrutinizing the identification survey data. Qualitative research approach is a comparatively new trend in the IS area, and the associated philosophy paradigm, research methodology, methods are under development and far from mature. Specific to this study, with its purpose being measurement model development, the study does not directly use any exiting measures of the object under study, and does not rely on conventional scale development procedures. A generally bottom-up and inductive approach is adopted, based on the data analysis techniques in Grounded Theory Methods and on qualitative Content Analysis. As the data is open-coded and expected to yield a model with concrete structure, the criteria of formative construct specification will be applied in the process of data coding. The qualitative data coding and analysis will result in a Mandarin version IS-Impact
measurement model covering a considerably complete domain of the formative latent variable: IS-Impact.

- **Interpretations and discussion**

Triangulating findings in the context study with the empirical evidence gathered in the identification survey, the researcher provides a discussion on the subjective evaluation of ES in China and the contextualization of the IS-Impact evaluation approach in China. Meanwhile, the researcher will compare the contextualized Mandarin version IS-Impact model with the original one. The comparison results will demonstrate similarities and differences of IS evaluations in different geographical and cultural contexts.

1.7 **Anticipated research contributions**

This study is part of the IT Professional Services (ITPS) research program efforts to provide a widely accepted IS-Impact measurement model. Having the Gable et al. (2003) IS-Impact measurement model and the definition of IS-Impact as theoretical foundation, the study attempts to explore IS-Impact phenomena in a new context (Chinese organizations). The study is significant as it is the first effort that empirically and comprehensively investigates IS-Impact in China. Specifically, the research contributions can be classified into theoretical contributions and practical contributions. The theoretical contributions refer to those contributions derived from the study that can be used by future researchers to derive new knowledge and enhance existing knowledge. The practical contributions refer to those contributions derived from the study that can be directly applied by practitioners and organizations. The contributions are listed below.

**Theoretical contributions**

- The study explores the state of enterprise systems in China and provides up-to-date information and observation based on triangulated evidence from a variety of resources. The descriptive report yielded from this study can aid in understanding Enterprise Systems in China.
Instead of employing existing measurements, the study attempts to construct a complete IS-Impact measurement item pool by directly soliciting Chinese users’ practical ES interaction experience. This research design stresses requisite relevance to practice, while searching to strengthen the degree of content validity of the IS-Impact construct.

This study provides an example of how to consolidate a formative construct from a large pool of relevant categories and sub-categories into a structured measurement model against criteria of formative construct specification and decision.

Besides substantial qualitative evidence providing an abundant analytical pool to construct a comprehensive IS-Impact measurement model, an inductive approach will be adopted to analyse qualitative evidence, entailing analytical thinking and exploration in terms of measurement model development and analytic theory construction.

This study results in a data-driven and inductive conceptualized IS-Impact model for the Chinese context. However, this model can be further parallel validated with the existing IS-Impact model, aiding in the ultimate generalizability of IS-Impact approach.

This study compares and experiments with diverse qualitative data analysis methods; the experience deriving from this project will inform other relevant study in the ITPS track.

This study explores the use of innovative research methods in a traditional study field; that is, a qualitative in nature study investigating a construct specification and conceptualization work.

**Practical contributions**

- The study will produce a context report on Enterprise Systems in China. This report can benefit organizations that have deployed or want to deploy such systems.
The study will introduce several prominent IS evaluation models and theories to Chinese practitioners and academics, bridging gaps between Chinese IS evaluation research and practice and that of western counterparts.

The model has the following features: it is an economical tool for evaluating the IS; it is easy to understand; it gauges the IS-Impact from multiple perspectives; and it uses tangible and less tangible measures.

### 1.8 The Thesis Structure

In this introductory chapter, the research motivations for a better understanding of IS-Impact in China were argued. The research objective and research questions were delineated based on research motivations, gaps and opportunities. Then, the overall research design was described. Following are discussions on each of the remaining chapters.

Chapter 2 - Reviews previous literature that is relevant to IS performance evaluation, such as IS-Impact, IS Success, IT value area, providing a summary of the current state of understanding of IS-Impact research.

Chapter 3 - Describes the state of the art of Enterprise Information Systems in China, providing a context report illustrating the current China ES market and major issues in terms of ES adoption, diffusion and evaluation in Chinese organizations. This chapter informs research objects and provides a basis to later aid in interpretation and discussion of study findings.

Chapter 4 - Discusses the methodology issues of the study. This chapter generically depicts major methodology choice and rationale of those choices, including: 1) demonstrating the grand research methodology; 2) choosing the type of empirical evidence that can deal with the research objective; 3) choosing the inquiry approach: induction or deduction; 4) choosing the data analysis methods; 5) delineating the data analysis procedure and techniques, and 5) demonstrating the reliability of the research design.

Chapter 5 - Describes the Identification survey. The chapter focuses on operational issues related to the employed methodology, namely, how the study applied the
research methodology and methods in the real research scenario and settled on the
methodology and methods in the research design. This chapter gives descriptive
accounts of a list of operational issues which demand careful consideration,
including data sampling, data unitising, data processing and the final assessment
for the results of the data analysis.

Chapter 6 - Presents study findings yielded from the identification survey: The
categories and sub-categories emerged from the data analysis.

Chapter 7 - Presents the interpretation findings of the identification survey, taking
account of previous observations in the context report and from prior literature: a
comprehensive discussion will be made regarding IS evaluation in Chinese
organizations.

Chapter 8 - Summarizes the study in terms of study findings, implications for knowledge
and practice, limitations of the study and potential follow-on research.
Chapter 2  Literature review

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2.1 Overview

The literature review aims to provide insights into research in the area of IS effectiveness and success evaluation, more specifically in Enterprise Systems (ES) success. The literature review will evaluate previous studies to explore key issues in light of Enterprise Systems, providing a summary of the current understanding of Enterprise System Success, and a review of the state of Chinese IS evaluation studies. The literature review is mainly organized into four sections. The first section focuses on Enterprise Systems. The second section reviews studies on the general topic of IS evaluations. The third section will focus on the IS/ES success research stream, which is at the centre of the review, since they provide the most relevant theories and models underlying this particular study. Finally, the last section is a review of the state of IS evaluation research in China.

2.2 Enterprise Systems

Enterprise Systems (ES) are software packages of applications that integrate all necessary business functions, within and across an organization, into a single system with a shared database (Shanks and Seddon 2000; Jessup and Valacich 2006). ES are considered one of the most remarkable innovative developments in the information systems arena in the 1990s and they have become widespread IT solutions as the organizations’ interest shifted from functional to process-based IT infrastructure (Al-Mashari, 2003). Nowadays, ES applications are adopted by many industries such as manufacturing, construction, finance and telecommunication (Chung & Snyder, 2000). The main reasons for adopting ES are standardization and integration of business processes in the organization based on best practices (Rao, 2000). ES is considered as a key enabler and a facilitator of Business Process Re-engineering (BPR), which was a very popular trend in 1990s (Soliman & Youssef, 1998). The standardized and integrated business processes based on so-called ‘best practice’ provide an accurate view of an organization which allows for a more efficient response to competitive environments.

There are several types of Enterprise Systems such as Customer-Relationship Management (CRM), Supply Chain Management (SCM) and Enterprise Resource
Planning Systems (ERP). The focus of the thesis is on the most popular class of Enterprise Systems, the ERP systems. The ERP systems integrate and support all aspects of business functions, such as accounting, inventory control, and human resources within an organization by way of sharing a common database and have common user interfaces. The ERP systems constitute a large sub-set of ES market. According to the Gartner Group, the worldwide ERP applications market grew to $21.4 billion in 2008 (Gartner, 2009). Over the next five years, the market is expecting a steady growth (AMR_Research, 2007). In the worldwide ERP market, the most dominant vendors are SAP AG, and Oracle, taking up 62% of the total application revenue. Recently, they face formidable competition from other vendors, such as Infor, Sage Group, Microsoft, Lawson and Epicor, these vendors have aggregately taken up 20% marketing revenue (AMR_Research, 2007). Since ERP is the most recognized and commercially success ES software in the ES market, many literature that studied ES focused on ERP suites or used ERP as a short-cut name for Enterprise System application. In this study, the terms of Enterprise Systems (ES) and ERP are largely interchangeable.

2.2.1 Defining Enterprise Systems

A variety of definitions of Enterprise Systems have been identified from the literature. Klaus, Rosemann et al. (2000) attempted to solicit an authoritative definition of ES systems (ERP) through surveying a board of distinguished researchers in this area. Although most of academics considered that it is difficult to arrive at a singular uniform definition, they shared a common view in some respects. Many of them have described ES as a software package that is “cross-functional integration of internal processes”, “comprehensiveness”, “and configurability”, and that imbeds “best practice” process models.

More specific definitions have been drawn by other researchers. A few typical statements describing an Enterprise System application are:

- Kumar and Hillegersberg (2000) defined ES as a configurable Information System package that integrates information and information-based processes within and across functional areas in an organization.
Shanks and Seddon (2000) concluded ES as a comprehensive packaged software solution that integrates organizational processes through shared information and data flows.

Rosemann (1999) defined ES as customizable, standard application software which includes integrated business solutions for the core processes (e.g. production planning and control, warehouse management) and the main administrative functions (e.g., accounting, human resource management) of an enterprise.

Skok and Legge (2002) defined Enterprise Systems as the implementation of standard software package to perform core business processes with customization for competitive differentiation.

Gartner research (2009) defined ERP as a technology strategy that integrates a set of business functions like finance, HR, purchasing and operational aspects, such as manufacturing or distribution through tight linkages from operational business transactions to financial records (Hestermann and Woods 2009).

Regardless of the definition of the ES, this IT artifact has unquestionably become a very important software application that exerts great influence in the business world, and attracting increasing academics to spend research efforts in this area.

2.2.2 The evolution of Enterprise Systems

The essence of ES is integration, namely integrating business process, information and data across functions, across business units, and across the world. Since the early days of computing in organizations, and as early as 1969, a miniature of an integrated architecture and a framework for organizational information systems was proposed by Blumenthal (Kumar and Hillegersberg 2000). While many attempts have been made to create in-house integrated systems by various organizations, the first-generation ES systems package began to appear in the manufacturing industry (Sedera 2005).

The concept of ES has evolved during the last four decades from the MRP (Material Requirements Planning) in 1970s, MRPII (Manufacturing Resource Planning) in the 1980s and ERP in 1990s (Al-Mashari, 2003). Enterprise Systems
today is extended and include front-end processes — those that involves customers — such as customer relationship management (CRM), supply chain management, and e-commerce.

Enterprise Systems have evolved from software packages which were initially designed to efficiently manage production material planning and inventory in the manufacturing industry. However, from the first-generation of ES system to the current Enterprise System package, ES has crossed the border of business functions, industries and cultures, even become ‘the entry price for running a business’ (Kumar and Hillegersberg 2000; Markus, Petrie et al. 2000). Nowadays, ES has already transcended the manufacturing functions and is able to support much more functionality, including sales, finance, human resources and purchasing. Furthermore, the contemporary ES has successfully made its way into most industries, such as non-commercial-oriented organizations or public sectors.

Another important phenomenon in the ES industry that needs to be noticed was that, increasing Small- to Medium-Enterprises (SME) became interested in implementing ES, whereas 10 years ago, ES were only attractive to very large organizations.

Nowadays, ES market has expanded far beyond the concept of the ERP, though many academics still employ the term of ERP as a short-cut name for business applications and enterprise software suites. Multiple application suites, such as SCM, PLM, CRM, supplier relationship management (SRM), human management (HCM), financial management suites, and industry-focused suites have emerged to solve the specific business requirements of different audiences. This market trend, namely the emergence of so many types of suites available, and often with similar or overlapping functional elements, increases users’ risk in making the right decisions for their choice of ES suites (Genovese, Woods et al. 2008). Thus, users selecting or deploying an ES package should understand their corporation’s needs for process integration and vendor’s different suites strategy, and then choose and incorporate the most appropriate ES application into their business strategy.
2.2.3 Characteristics of ES

Analysing the available generic ES systems, scholars have summarized the key characteristics of the software applications.

Klaus, Rosemann et al. (2000) synthesized nine key characteristics of ES applications which distinguish them from other types of IS. The unique characteristics include: (1) Rich configuration potentials and customizing potentials; (2) High functionality, aiming at providing a whole solution to enterprise or other organization; (3) Highly process-oriented, across many management functional modules; (4) Full documentation; (5) Multiple industries targeted; (6) Supporting business across countries; (7) High frequency and repetition of usage; (8) Consistent GUI throughout the whole application software; and (9) Very complicated administration (Klaus, Rosemann et al. 2000).

Shang and Seddon (2002) synthesized four important features of Enterprise Systems. Firstly, unlike custom made systems, ES comprise a pre-packaged software suite, with their own internal logic, including process architecture and in-built process. The packaged ES encapsulates a large number of pre-packed configuration options that enable the user to customize the system to suit their particular business need. The configurability gives organizations the flexibility of adapting and reconfiguring the system as their business environment changes. Secondly, the functionality of ES is evolving with regular upgrades and constantly advanced technologies. Those vendor-supported and mandatory system updates provide businesses with a continuous stream of new technology and business processes, as well as a tight bond between clients and the ES vendors. Thirdly, an Enterprise System requires sophisticated system and process knowledge on the part of its implementer and users. The adoption of ES adds new responsibilities and demands more expertise from both IT professionals and process owners in organizations. Finally, ES provides an application infrastructure for various innovations. ES creates an integrated value-chain-wide organizational infrastructure.

Botta-Genoulaz, Millet et al. (2005) considered that ES has a great impact on the transformation of an organization. McAfee (2006) argued that Enterprise IT is
characterized as a very top-down application that is imposed to define and specify the entire business process. Companies who adopt ES are obliged to initiate complementary organizational changes. ES cannot be adopted without introducing new interdependencies, processes and decision rights. Moreover, those ES-complementary changes should be initiated parallel with the implementation of ES.

Regarding the type of business process where an ES will exert changes – the IT Consultant Gartner Group made a distinction between administrative operational ES (ERP) deployments (Rayner 2010). The administrative ES deployments are those in which only administrative functions, HR, finance and procurement are deployed. Operational ES focuses on aspects such as manufacturing or distribution, in addition to administrative functions. For many service-centric and people-centric businesses, an administrative ES will be the core of their business application strategy. However, in some product-centric organizations, an administrative ES serves as the backbone, dealing with financial and people record, running centralized functions, while additional operational ES is deployed for business operations.

Regarding the speed of the organizational changes- McAfee (2006) asserted that ‘changes become necessary as soon as the new systems go live (p.145)’. Literature indicates the IT-enabled organizational changes can be either radical or incremental. The intensity and the speed of changes accompanying IT deployment are contingent with many other issues, including the organizational context, and the intentions and actions of key players around the adoption and use of the IT (Orlikowski 1993). Specific to some business context, a more incremental pace of organizational change, might be more suitable to particular adopters (Liang and Xue 2004).

ES also provokes the organizational-wide learning of both business and technology knowledge. As mentioned previously, ES is built in ‘best practice’ consolidated from a large numbers of organizations and experiences of vendors over years. This embedded knowledge and business process can enable, initiate and inspire organization’s innovations and their members learning and growing. The adoption
of ES entails a good educational opportunity for the entire workforce and brought a new degree of business literacy to employees. Meanwhile, the complex system also requires sophisticated system knowledge on the part of the users. They require that the users should have certain degree of knowledge, skills, and understandings of the technology.

Finally, ES is characterized with integration. The enterprise-based packages contain a set of packaged application software modules, with an integrated architecture, and become the primary engine for integrating data, process and information technology across the internal and external value chains. A growing body of literature addresses the issues of integration in many aspects from multiple level: (1) technical (system) integration (Shang and Seddon 2002; Chang and Kettinger 2009); (2) information integration (Davenport 1998; Chang and Kettinger 2009); (3) business (functions) integration (Gagnon and Pinsonneault 2009; Kien and Lian 2009); and (4) Enterprise integration (Kien and Lian 2009).

2.2.4 Benefits of Enterprise Systems

Since Enterprise Systems have become the “price of entry” for running business and the ES market has developed substantially (Sedera 2005), ES is perceived to benefit the business world in many aspects. Davenport (2000) commented that a good ES is a “technological tour de force”. It is beneficial to enterprises in several ways: (1) streamlines a company’s data flows and provides management with direct access to a wealth of real-time operating information, (2) supports companies to streamline their management structures, and creates flatter, more flexible, and more democratic organizations, (3) rapidly shifts sourcing, manufacturing, and distribution functions worldwide in response to changing patterns of supply and demand (Davenport 2000; Shang and Seddon 2002; Zhang, Lee et al. 2002). These benefits have already been translated into dramatic gains in productivity and enhanced speed in many companies.

Based on an analysis of the features of Enterprise Systems that have been identified from hundreds of ES vendor-reported ES implementation cases, Shang and Seddon (2000) have classified the benefits of ES into five categories, as shown in table 2.1.
Benefits | specification
---|---
Operational Benefits | Including process cost reduction, cycle time reduction and productivity improvement
Managerial Benefits | Including better resource management and improved decision making and planning
Strategic Benefits | Including supporting business growth, building cost leadership, assisting with product differentiation and building external linkages to customers and suppliers
IT Infrastructure Benefits | Including building business flexibility and IT cost reduction
Organizational benefits | Including supporting organizational change, facilitating organizational learning, empowerment of staff and helping to build a common vision

Table 2.1 Benefits of ES

These five business benefits from ES are achieved along a life-long process of the utilization of ES: different benefits were developed in different dimensions on different paths in different processes (Shang and Seddon 2000). Operational benefits tend to be realized sooner after the system implementation than other benefits, except for IT infrastructure benefits, which will be realized straight after the system is implemented to replace inefficient legacy systems. Management benefits happen at a slower pace than the operational benefits, since its realization is dependent on the organizational use of real-time comprehensive information, reduced operational errors and enhanced functional operations. Strategic and Organizational benefits are also realized on the premise of achieving operational efficiency, managerial effectiveness and infrastructure capability. The five benefits dimensions constitute a cyclic interaction throughout an ES life-span, and the combined strength of these benefits can assist the organization in gaining a sustained competitive edge for the future competition.
Gartner researchers argue that the enterprise should shift focus from the productivity benefits of the ES to the competitive value of ES (Woods 2009). Their reasons are twofold. Firstly, the total ES seldom can justify the total expenditure through total productivity savings, because the productivity benefits generated from the end-to-end business process are hard to measure. Furthermore, few enterprises will be able to justify their expenditures with only operational and/or productivity benefits. Secondly, most executives are less concerned about raw productivity than they are about profitability. Therefore, in terms of the business value and benefit of ES, Gartner analysis argues to emphasize profitability or competitiveness benefits of ES, instead of productivity benefits, because the former are of most relevance to senior executives evaluating the business impacts of ES and the ES investment.

2.3 Information Systems evaluation

Although the ES market had enjoyed tremendous boost and the ES applications had been regarded as ‘price of entry’ for enterprises’ business running, researchers find that many organizations encounter difficulties in realising promised ES benefits (Shanks and Seddon 2000; Mabert, Soni et al. 2001). In recently year, the industry press reported a slow down of sales and a shrinking ES market size. Severe ES failure cases like FoxMeyer Drug Corporation also become headline stories. The failure rate of ERP implementations as reported by Peslak (2006) and Gargeya and Brady (2005) ranges from 50 percent to as high as 90 percent. FoxMeyer even claimed that SAP R/3 system had sent the company into bankruptcy (Bingi, Sharma et al. 1999; Scott and Vessey 2000). However, there are also reported benefits of ERP projects implementation by some companies exceeding what they had been expecting from the projects.

Confronting the mixed results of IT/IS investments, there is a considerable debate about whether the IT revolution is paying off in higher productivity. Researchers are keen to find connections between IT investment and an organization’s productivity at many levels and from various perspectives. In the remainder of this section, the researcher provides a description of the recent state of the study field of
the IS evaluation. The objective of this section is to provide readers with general background knowledge and with an overarching understanding of research topics in relation to the IS evaluation. The review of literature suggests that IS researchers employ a variety of approaches and measures to evaluate the IT/IS value, performance, effectiveness, success and impacts. IS evaluation studies largely vary in terms of the object of study in IS evaluation and the measurements employed in IS evaluation studies. Therefore, this literature review will be synthesized with regard to these two issues.

2.3.1 The object of study in IS evaluation

The object of study in IS evaluation related to a ‘what’ question: on what domain of activity is the assessment focused? The mixed results of IT/IS evaluations can be arguably attributed to the disparity and lack of clarity in the object of study.

2.3.1.1 IT/IS project as the objects of IS evaluation

It is noticeable that great a deal of study effort addresses the success of ES implementations and ES projects rather than the effectiveness of the system in the post-adoptive stage. For example, there are significant amount of research on the Critical Success Factors of Enterprise Systems (Markus, Axline et al. 2000; Cheng, Deng et al. 2006).

2.3.1.2 IT investment as the objects of IS evaluation

‘IT investment’ is always considered as a study object in IT business value research, where scholars have adopted ‘diverse conceptual, theoretical, and analytic approaches and employed various empirical methodologies at multiple level of analysis (p. 285)’ (Melville, Kraemer et al. 2004), attempting to justify the business value of IT investment. Rai, Patnayakuni et al. (1997) suggested that ‘rather than treating IT investments as monolithic entities, the nature of IT investments that create business value should be detailed (p.91)’. Thus, IT investment can be differentiated into several categories, encompassing IT capital, IT budget, client/server expenditure, IS staff expenditure, hardware/software expenditure and telecom expenditure. Melville, Kraemer et al. (2004) found that the prevailing conceptualization of IT by IT business value researchers have diminished the credibility of this study trend in several respects: 1) IT is frequently operationalized
using aggregate variables measured in dollars or counts of systems, 2) software is often treated implicitly or sometimes omitted entirely in the conceptualization of IT investment; 3) IT is frequently assumed to lead to an outcome intended by managers, limiting the understanding of unintended consequences; and 4) the treatment of the role of IT employees is unsystematic and often excluded from the analysis as well.

2.3.1.3 Systems as the objects of IS evaluation

Seddon, Staples et al. (1999) provide a two-dimensional matrix as a useful guide for conceptualizing effectiveness measurement in IS evaluation research. The first dimension of the IS effective matrix is ‘System’, which is denoting the type of system being evaluated. The dimensions of ‘System’ consist of 6 categories ranging from the simple or micro application to complicated or macro applications: 1) An Aspect of IT design (e.g.; a single algorithm or form of use interface), 2) A Single IT application (e.g. a spreadsheet, a PC, or a library cataloguing system); 3) A Type of IT or IT application (e.g., TCP/IP, a data warehouse); 4) All IT application used by an organization, 5) An aspect of a system development methodology; 6) the IT function of an organization.

Alter (1999) criticized the IS effectiveness matrix of (Seddon, Staples et al. 1999) and argued, ‘their two dimensions ignore a central problem in understanding information system effectiveness, namely, that information systems are increasingly becoming integral parts of other work systems (p.41)’. Alter further advanced two main propositions of IS effectiveness evaluations. One is ‘the Siamese twin’ problem: IT is so interwoven into the fabric of what organizations do, so that it is hard, and possibly meaningless, to try to measure the effectiveness of the IT component alone. Alter also stated ‘Conceptualizing information system effectiveness without looking at the work system that is being supported is increasingly like evaluating one twin but consciously ignoring the other.(p41)’ (Alter 1999). Alter raised the second propositions, advising researchers to focus on measuring the effectiveness of what Alter calls ‘work systems’, than just information systems. In line with the two propositions, Alter (1999) and Alter (2003) scrutinized the most prevailing IS effectiveness model – the IS success model (DeLone and McLean 1992), and brought forward 6 questions upon each dimensions of the model.
Alter’s propositions and arguments involve re-considering boundaries for defining and analysing the IS effectiveness. Alter believed ‘moving toward a work system view shifts the focus for understanding success (p.378)’ (Alter 2003). Some supports exist for this shift. Seddon and Staples (1999) agreed with Alter’s philosophical position in a public response to the Alter’s critiques, and contented that ignoring systems that the IS support in the IS effectiveness evaluation will delimit the effectiveness of the assessment. Although the perception of conceptualizing the IS success by incorporating the theory of ‘work system’ is appealing, no IS effectiveness studies have advanced investigation on this issue.

2.3.1.4 IT function as the objects of IS evaluation

The role of IS has never stopped changing and progressing. DeLone and McLean (2003) observed that ‘the emergence of end user computing in the mid-1980s placed IS organizations in the dual role of ‘information provider’ (producing and information product) and ‘service provider’(providing support for end user developers)’ (p.19). Nevertheless, the trend of packaged ES implementation continues to intensify the role of service providers of the IS organizations and broaden responsibilities of the IT functions considerably. As ES is so integrated with organizational business processes and many employees’ work becomes dependent on the system, the IT function is confronting ever-increasing service demands from end-users and organizations. The service quality of IT functions is very influential to the ES performance and will indirectly influence the overall performance of the organization.

IS effectiveness evaluation scholars contend that IS researchers would mismeasure IS effectiveness if they do not include in their assessment package a measure of IS service quality (Pitt, Watson et al. 1995). Meanwhile, the IT business value researchers also argue that ‘the treatment of the role of IT employees is unsystematic and often excluded from the analysis, hindering our understanding of the role of IT management and technical expertise in generating IT business value (p.287)’(Melville, Kraemer et al. 2004).

The IT function has more recently been included as an important component in the IS effectiveness evaluations, in light of changes in IS practice. DeLone and Mclean
(2003), after reviewing and evaluating the debate of service quality, incorporated a
dimension of ‘service quality’ into their updated IS success model. A number of
good studies focusing on the evaluation of performance of IS functions and
end-user support were also identified (Saunders and Jones 1992; Shaw, DeLone et
al. 2002; Chang and King 2005). A variety of metrics and measurements were
proposed to assess the IS support quality by the researcher of the IS function and
the end-user support research steams.

2.3.1.5 Service as the object of IS evaluation

Similar to the notion of a dual role of the IS function, the artifact of ‘Information
systems’ also has evolved to manifest a dual role as both ‘product’ and ‘service’ to
customers. Thus, some IS effectiveness/success researchers proceed from a central
interest in the importance of evaluating Information systems in organizations, and
advance the IS evaluation by reconceptualizing the IS as a service (ISaaS) (Gable
and Rai 2009). The idea of conceiving IS as services is also endorsed by (Alter
2010), who extended the discussion of the work system to ‘service system’.
Although there are a lot of potential opportunities for the new direction of ISaaS,
this area is generally unexplored and no solid study results have been published
yet.

2.3.2 The measurement of IS evaluation

The measurement in IS evaluation related to a ‘how’ question: how do the studies
conduct the evaluation of the study object. As with the review of literature on the
object of IS evaluation, a review of the relevant literature found diverse
measurements employed in IS evaluation studies. The measurements in IS
evaluation can be generally categorized as either quantitative evaluation or
perceptual evaluation. Another pair of terms, namely objective and subjective
evaluation also refers to the same measurement phenomenon.

2.3.2.1 The objective measures

The quantitative/objective measurement is dominant in IT business value studies.
The term IT value relates to the organizational performance impacts of IT,
including productivity enhancement, profitability improvement, cost reduction,
competitive advantage, inventory reduction and other measures of performance
(Chan 2000; Melville, Kraemer et al. 2004). Kohli and Devaraj (2003) investigated past IT value studies and found that they have employed various types of measures in examining firm performance, including financial measures, productivity- and output-based measures, and also expense-based measures. Melville, Kraemer et al. (2004) also considered that operational measures and financial measures as useful evaluation metrics are capturing organization’s performance.

Some IT value Researchers criticized the over reliance on qualitative measures in IS evaluations and called for a more balanced perspective and a use of various hard or soft measures when conducting IT value studies (Chan 2000). Researchers in several IS evaluation areas pointed out that much effort had been make to measure IS success and value in terms of monetary indicators (DeLone and McLean 1992; Melville, Kraemer et al. 2004; Gable, Sedera et al. 2008). Venkatraman and Ramanujam (1986) argued that ‘financial performance is the narrowest conception of business’; they argue that using financial measures, especially those simple outcome-based financial indicators, are rather constrained in terms of assessing the business value of IT.

Financial measures are not able to account for intangible or indirect impacts that an ES delivers to the organization. It is argued that the reliance on hard financial criteria led to the myth of IT Productivity paradox (Brynjolfsson 1993; Chan 2000): the fast increase of computing power does not related to the growth of economy and realized benefits at many level of business. Based on traditional cost-benefit analysis, some studies attempt to quantify ES intangible benefits, and then convert the numeric results into a financial return. For example, Murphy and Simon (2002) reported a case study demonstrating that intangible benefits, e.g. improved customer service, can be incorporated into traditional evaluation methods. However, they also admitted that, in spite of those intangible benefits discussed in their case, it is more difficult to apply the financial quantification of other types of intangible ES impacts, such as managerial, organizational and strategic benefits.

In summary, quantitative or objective measures are ‘generally older, seek to quantify system inputs and outputs in order to attach values to the items’ (Powell 1992). However, it is difficult to achieve an accurate estimation of the returns to IT
investment based on the measurements of Business Economic Performance. In particular, it would be extremely difficult to quantify IS value in the IS-reliant sectors. Because IT capital demands more investments of complementary resources, it is impossible to estimate, among the overall organizational input, the extent to which the IT investment can account for enhancements of the organization’s productivity.

2.3.2.2 The subjective measures

The role of IT in organizations today is switching from technology focus to management focus. Accordingly, the evaluation of IS is also shifting from the assessment on financial profitability, technical performance and operational efficiency to the assessment of effectiveness, success and impact.

These types of IS evaluation studies are characterized as employing subjective measures, or so-called perceptual measures. Perceptual measures enquire about experiences, observations, attitude and behaviour of IS users when they interact with IS applications. Furthermore, perceptual measures can examine multiple aspects of the IS impacts, such as perceived quality of applications, quality of information products derived from the application, user satisfaction, perceived of usefulness of applications, and net benefits across levels of analysis (Shang and Seddon 2002; Ifinedo and Nahar 2007; Wu and Wang 2007; Petter, DeLone et al. 2008). Perceptual measurements provide an economic and efficient tool to benchmark IS Impacts. In addition, compared with financial terms, perceptual measurements can provide a common language to communicate results of the IS Impact assessment across business, technical and strategic users.

IS subjective evaluation was boosted when (DeLone and McLean 1992) published the seminal work in the field of IS success. Many researchers were then motivated to spend research efforts in this area. Because the paper of (DeLone and McLean 1992) and related subsequent studies are supportive of the approach embodied in this study, The IS success studies will be discussed in more details in the following sections.
2.4 The IS Success/effectiveness studies

2.4.1 A summary of early IS success studies

DeLone and McLean (1992) synthesized several characteristics of the earlier IS Success studies:

- **A broad list of dependent variables for IS research:** IS research has provided a broad list of dependent variables from which scholars chose the most relevant IS construct in relation to their IS evaluation. There was no consensus on the measures of IS Success and no single measure was assumed to be intrinsically better than another.

- **Lack of validation of measures:** Progress toward an MIS cumulative tradition dictates a significant reduction in the number of different dependent variable measures so that research results can be compared. Though many variables have been proposed as possible measurements of ES/IS Success, there was a lack of empirical evidence for their validity and reliability. Dimensions and measurements had been seldom testified to prove their content validity, construct validity and criterion related validity. The myriad of variables made it difficult to compare the results of similar research and to construct the necessary empirical knowledge.

- **Unexplored organizational impacts of IS:** few researchers employing field study had attempted to measure the influence of the MIS effort on organizational performance. DeLone and McLean (1992) explain this phenomenon in terms of it being difficult to isolate the contribution of the information systems function from other contributors to organizational performance. Sedera (2005) suggests that organizations tend to analyse Enterprise Systems by justifying the purchase or post-implementation impacts with financial evidence such as return on investment.

- **Incomplete and inappropriate IS success measures:** most of the early studies attempted to measure IS success in only one or possibly two success measures. However, IS Success is a multidimensional construct and it should be measured as such. Before DeLone and McLean, several researchers recognized the
complexity of the dependent variable and argued that it is inappropriate to capture IS success by a simple measure given that IS is not a homogeneous concept (Vanlommel and DeBrabander 1975). DeLone and McLean reviewed and summarized the early IS success works, and found among more than 100 studies, only 28 measured in multiple success measures. Most researchers tried to capture and evaluate the concept of IS success in one or two categories.

2.4.2 The DeLone and McLean’s IS-Success model and relevant improved model

Drawing on works of (Shannon and Weaver 1949; Mason 1978), DeLone and McLean (1992) proposed the IS Success model to summarize systematically both theoretical and empirical IS-Success studies which were published in seven prestigious IS journals in the 1980s. Based on the extensive review, DeLone and McLean categorized a myriad of measures that adopted by preceding researchers into a concise six-dimensional model, representing the phenomenon of IS-Success. This model consists of system quality (SQ), information quality (IQ), usage, user satisfaction (US), individual impact and organizational impact (OI), and is shown in figure 2.1.

![DeLone and McLean 1992 IS-Success Model](source)

Figure 2.1 The DeLone and McLean 1992 IS-Success Model (Source: DeLone and McLean (2000))

In this model, SQ and IQ will jointly or separately affect both the usage and User Satisfaction. Additionally, the amount of the usage will affect the degree of User
Satisfaction positively or negatively, and vice versa. Usage and User Satisfaction will then be direct antecedents of individual impact, and this impact on individual performance should eventually have some Organizational Impact. The strength of this model is in its simplicity and robustness, while it also gives a holistic view and explanation to IS success. The researchers conceptualized and operationalized IS Success by introducing the idea of taxonomy and a multidimensional model. In the meantime, they revealed another nature of the IS success phenomenon, that is the dimensions cannot be isolated, because they are independent and integrated to constitute the comprehensive dependent variable – IS Success.

DeLone and McLean (1992) suggested several potential aspects where much work was still needed: (1) Measuring and validating the possible interaction among the success dimensions; (2) reducing the number of different measures used to measure IS success in order to enhance the comparability of the research findings; (3) More field study research to investigate and incorporate organizational impact measures; and (4) IS Success models needing further development and validation before they could serve as a basis for the selection of appropriate IS measures.

- DeLone and McLean’s 2003 IS Success model

Since DeLone and McLean published their study “Information System Success: The Quest for the Dependent variable”, articles have been published to critique, validate and extend their IS-Success Model (DeLone and McLean 2000). Having reviewed many of the important IS Success research contributions published after their 1992’s study, DeLone and McLean (2003) presented an updated IS-Success Model in light of the changes in IS practice. The model is showed in figure 2.2.
There are four enhancements in the 2003 DeLone and McLean IS-Success model. The first one is that the model incorporates Service Quality (SQ) in the framework. As service quality has become an indispensable feature of the IS department or provider, and excellent service will attribute to high level user satisfaction, therefore neglecting this dimension would lead to inaccurate assessment of IS success. The second revision happened in the dimension of Use. Given the great number of criticisms of the immaturity of success measures and the confusing interpretation, DeLone and McLean have revised this dimension into Intention to Use or Use. In the updated model, the author replaced the original dimensions of Individual Impact and Organization Impact with Net Benefits. DeLone and McLean also suggested that the researcher should specify the Net Impact according to their particular research context. The fourth revision is that they identified several proposed causal associations between those dimensions.

One of the greatest enhancements compared with the antecedent model lies with the more specific demonstration of the causal relationship within each construct. Another great improvement is introduction of Service Quality into the framework. However, the Use construct still remains blurred, though the authors tried to interpret it by introducing “Intention of Use”. Their original idea of classifying prior measures of success is worthwhile to appreciate, but their attempt to
inter-relate the constructs causally in their model requires further tests and discussion.

2.4.3 Subsequent IS Success research

Although DeLone and McLean (D&M)’s IS-Success Model is an essential contribution to the ES-Success field, the model and the research area of subjective IS evaluation were far from mature and required further effort. Therefore, many researchers have devoted efforts to improving, validating, challenging and extending the D&M Model in order to gain a better understanding of the nature of ES-Success and to transfer it into knowledge which will benefit practitioners and industry.

A number of studies have undertaken empirical investigation of the multidimensional relationship among the constructs of the D&M IS Success model. Seddon and Kiew (1996) found a significant relationship between “System Quality”, “Information Quality”, “Use” and “User Satisfaction”. Other research has extended D&M’s Model into new contexts, for example, Molla and Licker (2001) extended the ES success research into the E-Commerce context to validate whether D&M’s Model was still reliable and explainable in the new, but very important, IS application. With regard to the practical measurement instrument development, Mirani and Lederer (1997) developed a 32-item instrument to measure organizational benefits. This proposed instrument responded to DeLone and McLean’s call for some more concise dependent variable measurements.

Researchers also brought forward their criticisms and extended the IS Success model. Seddon (1997) argued the original IS Success model is “both confused and misspecified”. He further claimed that DeLone and McLean’s attempt to combine process and causal interpretation. He asserted that the IS Success models actually consists of three models. Seddon later respecified the IS Success model, by splitting the original model to two variance models and eliminated the process relationships embodied in original model. Rai et al. (2002) later empirically compared DeLone and McLean IS Success model (1992) and Seddon’s respecified IS Success model. The researchers investigated the two models in a quasi-volitional usage context, operationalized key IS success constructs by using
previously validated measures, and tested the relationships among part of these measures. The empirical evidence suggests that both models have explanatory power, indicating that each model has merit for explaining IS success. Rai’s study provided verification of DeLone and McLean’s argument for an integrated model among their taxonomic categories.

DeLone and McLean (1992, 2003) argued that the evaluation of the phenomenon of IS Success cannot isolate the environment from where the IS exists. The selection of success dimensions and measures should be contingent on the objectives and context to the empirical investigation. Other scholars have echoed a similar argument. Myers’ work combined the D& M’s IS Success model and Saunder’s and Jones’ ‘IS Function performance evaluation model’. Myers articulated that, when assessing the IS function in organization, we should place the dimensions and measures in the context of the organization. He also suggested a list of issues relating to the research context that scholars need to consider when measuring IS success. D & M’s IS success category provide the evaluator with a wide range of assessment measurement to select from, but S & J’s model facilitates choosing the appropriate dimensions and measurements to fit particular assessment contexts. In some later work, scholars demonstrate the IS structure, IS plan and corporate culture’s impacts on IS performance evaluation (Ishman 1996; Heo and Han 2003; Randy V. Bradley, Jeannie L.Pridmore et al. 2006). These studies incorporate the new constructs into the model of DeLone and McLean and further build a more comprehensive model to address Information System Success better. These are sound attempts to get a better understanding of IS success; however, whether the construct, such as IS plan, is a measurement or an antecedent factor might need to be re-considered.

The most comprehensive IS success studies identified recently are two quantitative literature reviews conducted by (Petter, DeLone et al. 2008) and (Sabherwal, Jeyaraj et al. 2006). Employing comprehensive meta-analysis, these literature reviews set out to examine if the results of empirical studies support the relationships posited by the original success model. Both studies revealed that some relationships within the model have received consistent support (i.e. significant results across all studies) while others has received only mixed support.
In particular, Petter, DeLone et al. (2008) examined if the level of analysis under study, namely, the analysis at the level of individual or the organization will inform the validation of the success model.

2.4.4 The IS-Impact model

The previous section describes how there have been a large number of studies that have attempted to further the understanding of the IS Success model by attempting to validate some, or all, of the model. It is worthwhile to note that most of the studies focused on the examination of interrelationships among dimensions of IS Success model. However, very few spend effort on the measurement issues of IS Success. It was until the recent study, the ‘IS-Impact measurement model’ proposed by (Gable, Sedera et al. 2008), the measurement issue of IS success are comprehensively discussed.

The study conducted by (Gable, Sedera et al. 2008) include 3 surveys in 2 research phases to test the reliability and validity of the IS success model, resulting in a comprehensive and multi-dimensional IS success instrument and an IS-Impact measurement Model. The IS-Impact model comprises 27 measures organized into four distinct and individually important dimensions: System Quality (SQ), Information Quality (IQ), Individual Impact (II) and Organization Impact (OI). The IS-Impact model is shown in Figure 2.3. Of note, this research explicates the formative nature of IS success dimensions and validates the IS-Impact model according to formative construct validation guidelines proposed by (Diamantopoulos and Winklhofer 2001; Jarvis, MacKenzie et al. 2003; Petter, Straub et al. 2007; Diamantopoulos 2008)

![Figure 2.3 The IS-Impact model](image)
In the process of model specification, the dimension of Usage in the D&M’s model has been removed, due to demonstrated lack of validity and variability in the model validation test. The dimension of Users Satisfaction has been eliminated from original model as evidences show its better standing either as an overall index across other dimensions to depict the impact of IS, or as an immediate consequence of the IS-Impact, rather than being a dimension of IS-Impact. The other four dimensions gained substantial support and passed the factor analysis, then remained in the IS-Impact Model. When evaluating an enterprise system, the IS-Impact model will represent a snapshot of the organization’s experience of the enterprise system at a point in time. The impact dimensions are an assessment of the benefits that have followed (or not) from the system. The quality dimensions reflect future potential. Together, these four dimensions reflect an ostensibly complete view of the enterprise system—an overarching measure of enterprise systems success (Sedera, Gable et al. 2004; Sedera 2005; Gable, Sedera et al. 2008). The researchers defined IS-Impact as being measures at a point in time, of the flow of net benefit from the IS, to date and anticipated, as perceived by all key users.

Petter, DeLone et al. (2008) praised the IS-Impact research as followed:

‘what makes this particular instrument to measure IS success unique is that this instrument captures the multidimensional and complex nature of IS success by measuring four key success dimensions and by using at least four measures for each dimension....It is encouraged to see research conducted to create a strong, multidimensional instrument to measure IS success, which overcomes a major shortcoming in previous IS empirical work; namely, inadequate measurement of the dependent variable, IS success (p.242)’

The IS-Impact model displays several notable strengths

- Completeness of the dimensions and measures

One of the strengths of the IS-Impact model is the completeness of the model’s dimensions and measures, namely all the dimensions and measures that should be in the IS-Impact are included (Sedera 2005). DeLone and McLean (1992) identified that a problem in the IS Success area was that many researchers tended
to employ only one or a subset of dimensions as a surrogate for overall success. Having utilized all six dimensions of IS success model as a theoretical framework and gone through three rounds of survey, the IS-Impact model ensured its completeness of the dimensions and measures. Further, the breadth of the sample in the research design adds confidence about the completeness of the model. Some empirical evidence from the Gable et al. study also demonstrates the characteristic of completeness of the IS-Impact model, such as the high total variance from specification and confirmation survey, good criteria validity of the measuring dimensions, and high reliability of the model gauged through Cronbach Alpha (exceed 0.9).

- Mutual Exclusivity and Additivity of the dimensions and measures

Mutual Exclusivity implies that all the dimensions and measures are genuinely distinct from each other; in other words, not only does every dimension represent an important aspect of IS success, but also they do not overlap with others. The mutual exclusivity of the IS-Impact model has been achieved through a precise and truly scientific research process. The mutual exclusivity of the IS-Impact model is tested and verified in the exploratory factor analysis employed in this study. The additivity of the model is evidenced by the factor analysis results and the outputs from a structural equation modelling exercise.

- Explicating the formative nature of IS-Impact

The success and impact of IS are abstract and unobserved construct. Looking into the theoretical rationale of the IS-Impact measurement model by Gable et al (2008), and its predecessor the IS Success model, both of them manifest the characteristics of formative construct. DeLone and McLean (1992) argue that IS Success is a multi-dimensional construct and is composed of six dimensions (System Quality, Information Quality, Organizational Impacts, Individual Impacts, Usage and User Satisfaction). Regardless of the mixed evidence regarding inter-relationships among the six components, each composite dimension will theoretically contribute to the latent variable – IS Success. Taking up the IS Success model as the theoretical underpinning, (Gable, Sedera et al. 2008) reconceptualises the IS-Impact measurement model as a formative construct. The IS-Impact is explicitly
defined as an explanatory combination of indicators that are comprised of a combination of quality measures and impact measures.

- **External Validity of the IS-Impact**

External validity denotes generalizability of inferences obtained in a study to other individuals or entities, other settings or situations, other time periods, or other methods of observation/measurements (Sedera 2005). To further strengthen the external validity of IS-Impact, several researchers are extending this model into new industry sector or new research contexts, such as Ifinfedo’s work which has examined IS-Impact approach in Finland and Estonia (Ifinfedo 2006), and several on-going ITPS studies attempted to extend the model to different geographical and culture context: Malaysia and South Arabia; as well as to other type of ES application: Supply Chain Management (SCM) and university’s administration IS. This study is a particular research effort, also supported by ITPS study track, QUT, committed to extending the IS-Impact model into Chinese context, and to further strengthening the external validity of IS-Impact approach.

- **Measures manifesting features of contemporary ES**

Another strength of this model is that the instrument was rigorously tested within the context of Enterprise Systems to ensure its validity. The ever-increasingly complicated IS artifact imply a fact that successful ES adoption and usage is no long a pure technology issue. In order to realize positive ES impacts, organizations have to make endeavours to achieving complementary organizational innovations, including better-skilled workers, high level teamwork, re-designed processes and new decision rights (McAfee 2006). Hence, the contemporary ES requires a more comprehensive measure, gauging impacts from both individual and organizational level, and benefits related to corporations’ business effectiveness and efficiency.

### 2.5 Chinese IS Success/ IS performance evaluation studies

An expansive literature review, with regard to the IS evaluation studies published in top tier academic outlet in Mainland China, has also been carried out in the study. This review serves several purposes: 1) gaining an understanding of the status of IS
evaluation in the Chinese research context; 2) identifying any established IS evaluation model and validated instrument published in China; and 3) providing the context-specific model, instrument and study findings to complement the mainstream of Western study efforts identified previously, leading to in a broader, more generalized understanding of the topic of IS evaluation. The candidate has identified 53 Chinese IS evaluation studies which are published in Chinese research journals from middle of the 1990s to current time. All the papers were found in www.cnki.net, which is the most recognized academic database in the Mandarin Language in Mainland China. In the course of reference searching, the researcher used “IS Impact”, “IS evaluation Index”, “informatization evaluation” as key words to locate relevant literature.

Of the 53 relevant papers, 16 papers containing IS evaluation frameworks were identified. It is noted that most of the Chinese IS evaluation studies cross both the implementation and post-implementation stages; thus, the measures in the IS evaluation models relate to both IS implementation success and IS effectiveness at the post-adoptive stage. As this current study is concerned only with IS assessment at the post-implementation stage, this section concentrates only on measures and dimensions pertaining to this phase of the IS life-cycle. We found that, as with western scholars, Chinese IS evaluation scholars tend to assess information system from the aspects of system quality, benefits, and usage. This section will subsequently review the evaluation measures and dimensions briefly. Several characteristics of Chinese IS evaluation models are also described later in the section. A specific demonstration of Chinese IS evaluation models and frameworks can be found in Appendix A.

- **The evaluation of system quality**

The most frequently cited dimension in Chinese IS evaluation models is System Quality. As Western researchers did in the IS success area, so Chinese academia also regard system quality as an important index to reveal the success of IS. They argue that systems with good quality guarantee the effectiveness of the system (Min, Chen et al. 2000; Liu 2003; Zhai and Xu 2003; Hao and Yu 2005). Of note, the most representative measures of system quality are: (1) System reliability, (2) Ease of maintenance, (3) System scalability, (4) System portability, (5) System
Security, (6) System Efficiency; these measures have been included in each of these IS evaluation models. On the other hand, researchers (Min, Chen et al. 2000; Qiu and Zhang 2004; Huang 2006) suggest the items of system customization, usability and extendibility are crucial measurements to gauge system quality.

- **The evaluation of IS Benefit**

Chinese scholars have evaluated IS benefit at a rather high level of analysis, focusing on impacts in organizations, in the nation and in society; few studies have surveyed IS impacts on individual users. IS benefits are comprised of economic and social benefits. With regard to economic benefits, the researchers normally further classified this dimension into intangible and tangible economic benefits (Xu and Zhang 2001; Ding, Chen et al. 2006), otherwise as direct or indirect economic benefits (Chen and Zhang 2000; Gao 2007). However, none of the studies specify the particular measuring items and/or financial metrics in their dimension of ‘economic benefit’. It is worthwhile noting that a number of researchers incorporate national or social benefit into their framework, since they realize that the influence of contemporary IS will go beyond the boundary of the organization and have effects on the external business environment where the organization is embedded (Feng and Bemelmans 2001). Xu and Zhang (2001) suggests that impacts that information technology can exert in the social level might manifest itself in terms of (1) Overall social benefit, (2) Improvement of relationship between the enterprise and the external environment, (3) Decreasing the risk of decision making, (4) Improving the working and quality of labourers, (5) Improving informatization of overall society, (6) Promoting production automation, (7) Reducing redundant production and resource wasting. At the level of the organization, Chinese scholars utilized a number of perceptual items, such as scientific management, working effectiveness, User Satisfaction and Utilization of the system to capture IS benefits in the adopting organizations. There is an absence of the dimension of Individual Impact on IS evaluation/IS success research in mainland China. Chinese scholars seldom view the “IS effects on individual” and “personal experience with IS” as an imperative indicators of IS effectiveness and success.
- **The evaluation of IS Usage**

Chinese scholars employ several usage-related dimensions. Researchers who have employed this dimension have incorporated a number of straightforward measures to assess the state of the IS usage in a Chinese enterprise. The most frequently cited measures include security and reliability of operation, user friendliness, and the utilization rate of the system.

Another IS usage-related dimension is ‘System Operation’, which is a new variable only more recently appearing in Chinese IS evaluation literature. The most frequently cited measures of ‘System Operation’ includes the terminal’s operation, which consists of the quality of input and output information, ease and security of operating the terminal, and the user’s satisfaction. It has been found in four Chinese IS evaluation / IS success papers (Chen and Zhang 2000; Guo 2000; Min, Chen et al. 2000; Guo 2005; Huang 2006).

It is observed that some measures of this category are relevant to the dimension of Information Quality used by western scholars. For instance, input/output standardization and report completeness are usually found as measures of information quality.

- **Comprehensive Multidimensional measuring model**

It is noticed that all the Chinese IS evaluation models are comprehensive multidimensional models, consisting of at least three and at most eight categories to describe the IS success phenomenon. The researchers in the IS Success field in Mainland China appear to have achieved agreement that the contemporary IS should be evaluated “comprehensively” and “completely” (Min, Chen et al. 2000; Feng and Bemelmans 2001; Huang 2006). Feng and Bemelmans (2001) conclude that the four criteria to direct the generation of an IS evaluation index systems are: completeness, relevance, usefulness, and usability. However, Chinese scholars take a cross-sectional perspective of IS effectiveness and success; no causal or process relationships among the dimensions were proposed in their model. Each dimension pertains to one aspect of IS success and they aggregate to produce an overarching success index.
• **Insufficiency of theory supports and the absence of model validation**

One of the problems of Chinese IS evaluation models is a lack of theory basis and theoretical support. Few papers provide theoretical underpinnings and conceptual justification of their proposed IS evaluation models. The insufficiency in theory demonstration reduces the credibility of models and other research findings. One possible explanation is that the categories of IS evaluation come from the Chinese IS scholars’ experience and intuition derived from practical IS design or implementation projects that they have been involved with. There is a long tradition in China that Chinese IT scholars have close ties with practitioners, and most of them have a great deal of exposure and intensive involvement in many forms of collaborations with industry. Many IT scholars will participate directly or be invited as consultants in a Chinese corporation’s internal IT projects. Therefore, they may derive these IS evaluation models by drawing on the knowledge accumulated from industry projects. Even though lack of theoretical support has weakened the value of Chinese IS evaluation studies, we cannot totally dismiss these works because of the intuitiveness and relevance manifested by Chinese studies.

Furthermore, no Chinese IS evaluation frameworks/models have been validated so far. Chinese researchers spend a great deal efforts on how to put the evaluation framework into practice and on mathematic algorithms to calculate the results of IS evaluation (e.g. Fuzzy method). The issue of model validation has been ignored. In the studies which adopted the survey method, the research did not discuss how the survey instruments have been operationalized from the original evaluation model, and validation of the instrument is scarce as well. Because of a lack of discussion on theory demonstration, model validation and instrument operationalization, there is no evidence of the model’s credibility and scrutiny. It is impossible to demonstrate the necessity, completeness, additivity, and mutual exclusivity of the models as well.

• **Consistency in dimensions but chaos in measurements**

Chinese IS evaluation studies have arrived at some extent of consistency in the dimensional level of the models. 85% of frameworks/models include System
Quality, and more than 80% models incorporate technical categories: Technical Competence and IS Implementation Success. The dimension of Net Benefit is employed by more than 68% of Chinese IS evaluation models. Performance, Operation, and Cost of IS are included in more than 30% of IS assessment frameworks/models. Although there is similarity at the level of dimension in these Chinese IS evaluation models, the measures of each dimension are inconsistent. Different studies employ idiosyncratic operationalizations for the same construct.

Several reasons might assist in explaining the confusion in the usage of measuring items. Firstly, few Researchers carefully justify their model in the model conceptualization stage. The lack of conceptual justification and theoretical underpinnings handicaps the real agreement in the dimension and measurement selection. Secondly, this problem is due to the lack of validation and testing of the IS evaluation model. Model validation testing can explicitly examine construct validity, criterion validity and reliability of the model. It will help to identify redundant measurements and dimension as well. DeLone and McLean (1992) considered that the existence of so many different success measures adds difficulties in comparing the results of similar studies and to build a cumulative body of empirical knowledge. This phenomenon indicates the importance of Chinese IS research seeking success measures that have been developed, validated, and applied in previous empirical research.

2.6 Literature Review Conclusion

The literature review encompasses a synthesis and discussion of four relevant fields of studies, including Enterprise Systems, Information evaluation, IS success/IS-Impact study, and the Chinese IS evaluation study. It was established at the outset that the aim of this literature review is to provide research directions and to aid in an overarching understanding of the study of interest. In order to achieve this objective, the related disciplines were surveyed and relevant sub-disciplines were identified. These sub-disciplines are presented in this literature review. In the course of reviewing the literature, besides the possible research directions, several additional objectives for this literature review were also defined 1) to identify and
summarize prior research relevant to the field of study, 2) to identify relevant theories and models related to the research project, and 3) to serve as source of interpretation for the future research findings.
Chapter 3  The Context Report: the state of Enterprise System in China

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3.1 Introduction

Enterprise Systems are seen as systems designed to help to improve competitiveness through streamlining workflow, reducing costs, improving decision quality and resource control (Howcroft, Newell et al. 2004). In the latest decade, China has witnessed a dramatic increase in ES adoption and diffusion, on the premise that ES will drive strategically important organizational change in Chinese organizations. However, despite the promise and continued popularity of ES, evidence is accumulating to demonstrate that obtaining the benefits from ES is not as straightforward as we used to believe (Howcroft, Newell et al. 2004; Shue, Chae et al. 2004). Statistics show that the ES success rate in China is approximately 10% (Xue, Liang et al. 2005), which is much lower than the figure released by western counterparts. Confronting such a huge discrepancy between high expectations and unsatisfied results of ES adoption, the study attempts to identify the reason for the discrepancy and search for implications for managing ES usage and evaluation in a Chinese context.

This context report is a comprehensive literature review of the state of ES package applications in China and the relevant management issues of ES, aiming to acquire an in-depth understanding of the Chinese ES context. The review starts with an overview of China’s ES market. The unique Chinese ES product evolution will be discussed. Subsequently, the literature review will focus on ES adoption in China, including the motivation of Chinese organizations, primary critical success factors in relation to ES implementation and obstacles to the success of ES adoptions and assimilation.

The review of literature indicates that misalignment between the ES package and Chinese organizations is the major obstacle hampering the success of ES in China. This misalignment, also called ‘misfit’ (Soh, Kien et al. 2000), incompatibility (Yusuf, Gunasekaran et al. 2006), or lack of organizational fit (Brown and He 2007), was caused by a variety of differences between the nature of the package and that of the implementation context (Soh and Sia 2004). The misalignment has

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2 Enterprise Resource Planning system (ERP) is a subset of the Enterprise Systems. Given its popularity, the ERP systems is the center of interest in the studies of ES. A large number of ES literature identified here is committed to ERP as well. Thus, in this chapter, the term ES and ERP are interchangeable.
resulted in many issues that worried Chinese ES practitioners and adopters, such as the frustration of global vendors in the Chinese market (Liang, Xue et al. 2004), problematic localized software products (Liang and Xue 2004), miscommunications between external ES experts and ES adopters (Avison and Malaurent 2007), and difficult business process reengineering in Chinese ES implementation projects (Yusuf, Gunasekaran et al. 2006). Therefore, a core section will focus on the package and context misalignment issue in this context report. A variety of facets of the misalignment will be discussed and summarized.

Finally, the review will discuss the source of the misalignment between the ES package and context, namely the context difference variables affecting ES adoption and assimilation in China. Context variables are identified in the earlier literature review; some of them are imposed by the national context, such as culture, language, and national administrative system, national policy, and the rest are voluntarily chosen by the specific organizational context, such as organization ownership, specific IT experience, top management preference, and corporation strategy to sustain competitiveness. All these context difference variables are attributed to the Chinese user perspective and behaviour towards ES; these differences need to be taken into account in this study, since the study aims to investigate the IS-Impact phenomenon in the Chinese context.

3.2 Overview of China’s Enterprise System market

3.2.1 The ES market size
The enterprise management software market defined by CCID comprises the segments of: financial management software, ERP software, CRM software, SCM software, HRM software, and EAM software (CCID 2007). China is the second-largest software market in the Asia/Pacific region, with 19% of the regional market in 2005. The software industry is projected to enjoy an 18.5% compound annual growth rate from 2005 to 2010 as Gartner (2006) forecast.

Since 1997, the sale revenue of the Chinese management software market increased by 31.5% and accounted for 25.3% of the domestic software market. From 2000 to 2002, China’s management software market was growing more than
20% annually. In 2004, the market experienced recovery from 2003’s downturn due to the outbreak of SARS, with sale revenue growing more than 20% (CCID 2006). In 2006, China’s management software market was worth 7,136 million Yuan, up 19.5% from 2005, year-on-year. Growth slowed down compared with the previous few years. China’s ES market is now in a period of steady growth, largely due to the shift of enterprise IT application from massive deployment of new systems to deep and intensive application (CCID 2007; CCID 2007). The sale revenue and increased rate of China’s management software market from 2001 to 2005 is shown in figure 3.1.

![Figure 3.1 The sale revenue and increase rate of China’s management software market from 2001 to 2005 (Source: CCID (2007))](image)

Figure 3.1 The sale revenue and increase rate of China’s management software market from 2001 to 2005 (Source: CCID (2007))

As for the vertical industries, manufacturing organizations, though affected by the slowing economy, will continue to be one of the key vertical industries in China, because of the increasing need to rely on IT to remain competitive. Other vertical industries, such as financial services, telecommunications and utilities, are also adopting ES at an increasing rate (Ganly and Dharmasthira 2008).

The Gartner Group observe a new trend in the mid- or low-level ES market in China (Ganly and Dharmasthira 2008). In the early 2000s, ES were largely implemented in large state-owned enterprises (SOE) and joint-ventures companies. Take SAP as an example; the world’s largest ES manufacturer was reported to have more than 300 clients in China in 2006, a large number of them being large SOE (Yusuf, Gunasekaran et al. 2006). Since 2003, most ES manufacturers have started to pay attention to small- and medium-size Chinese companies. The vast number of Chinese SME companies, who are eager to change their low efficient business running processes, promise huge opportunity to both local and international
vendors. The awareness of requirements from Chinese SME firms, and the increasing competitiveness in the high-end market, will help to further spur growth in the ES market segment of China’s SME companies (Ganly and Dharmasthira 2008).

3.2.2 The fierce competition between local and global vendors

The China ES market is a mixture of local and global ES vendors (Ganly and Dharmasthira 2008). An interesting observation of the Chinese ES market has been made: those powerful global vendors, who account for approximately 63.2% of ES market in other regions (Xue, Liang et al. 2005), are unable to capitalize in the China market on their financial strengths, their expertise, their advanced technology, and their experience (Liang, Xue et al. 2004). However, the domestic ES suppliers have had a commercial presence for less than 10 years but now have the majority of the market (Brown and He 2007).

Global vendors initially took a strong representation in China in the late 1990s (Brown and He 2007). According to (Zhang, Lee et al. 2002), five leading international vendors took accounts for 63.7% of the total market, specifically, SAP at 30%, Oracle at 21%, Fourth shift, JDE and QAD respectively with 7% each. The top two domestic ES vendors, Kingdee and UFsoft (known as Ufida nowadays), hold just 2.3% and 2% in the ES market. However, in 2007, the scenario of the Chinese ERP market changed dramatically. Of the top five vendors making up almost 80% of the market, three local vendors, Ufida, Kingdee and Inspur Generalsoft, accounted for 56% of the market in China. SAP and Oracle, the top two global manufactures rank only fourth (15.3 %) and fifth (8.2%) in this market (Ganly and Dharmasthira 2008). Figure 3.2 describes the ERP market share percentage in China, as released by the Gartner Group in 2007.
Figure 3.2 ERP vendors in China (Source from the Gartner Group)

Figure 3.2 shows that the international vendors have difficulty in penetrating the Chinese ES market. Nevertheless, the literature reports obstacles when international vendors attempts to promote product selling in the SME market, which is dominated by local vendors (Liang and Xue 2004). The difficulties encountered by global vendors are mainly attributed to the unique Chinese institutional, business and cultural context. Insufficient understanding of the Chinese context has frustrated those global ES giants in this market.

Liang, Xue et al. (2004) synthesize seven obstacles confronting global vendors: language, report format and content, cost control module, price, business process redesign, customer support and local consulting companies. The barriers of language, report format and cost control model highlight the incompatibility between the ES package and Chinese business settings due to imposed context variables, such as culture, government regulation and industry conventions (Soh and Sia 2004). This will be discussed in detail in a later section.

Among the obstacles, business process redesign is employed because of the rapidly changing regulatory requirement in China. Foreign vendors need to recognize the dynamic need of Chinese clients and to provide them with flexible ES solutions that respond to frequent business process redesign (Soh and Sia 2004). The obstacles of high price, limited customer support and incompetent local consulting companies reveal the reality of the development stage of China: here, IT maturity
has not been attained compared to the West. In China, a large number of organizations, especially SME companies, are not able to allocate adequate financial and human resource to IT, which has been regarding as a marginal and supportive function for a long time. Thus, when they face such complex ES applications, they need to outsource the supply of knowledge and service to external parties with an affordable price.

Compared with global competitors, local vendors are more aware of those requirements and contextual factors. UFsoft (now known as UFIDA) has become established as the top-tier vendor in China by implementing a series of business strategies, including (1) devising localized ES applications that reflect the local management feature, (2) customizing ES systems at a variety of levels to cater for Chinese organization at different development stage, and (3) carrying out an incremental BRP (Liang and Xue 2004).

Besides, international vendors need to realize that capital and technical advantages cannot guarantee their success in Chinese market. Chen, Wu et al. (2007) surveyed 286 Chinese managers and asked them to rank the importance of IS management issues in China. The item ‘Applications with advanced IT’ was rated as one of the least important issues (9 out of 12) in the ranking. It suggests that Chinese managers become rational in choosing IT applications; the notion that new or advanced technologies are never equivalent to successful IS management has been widely accepted among them.

3.2.3 ES evolution in China

As the ERP applications is the most dominant software applications in the China ES market, the primary review is of the course of evolution of ERP products in China. The evolution of ERP in China has been very different from that in Western markets (Xue, Liang et al. 2005; Brown and He 2007). As stated in Chapter 2, in western countries, the ERP evolution has developed naturally. The idea was founded in manufacturing companies and the systems gradually evolved into this current concept of ERP (Xue, Liang et al. 2005). Having evolved from the early form of the MRP, a full range of operating and management needs were eventually incorporated and these enterprise systems are extended to to-date ERP.
Through a review of the literature, a totally distinct ERP evolution course is identified in China. Rather than originating from the manufacturing area to fulfil production needs, Chinese domestic ERP package softwares were developed through accounting software designed to satisfy daily accounting operations in Chinese organizations. China’s ERP course of evolution went through three stages: accounting software, financial software and ERP applications (Xue, Liang et al. 2005). The accounting software development stage started from the early 1990s. This software mainly aims to establish electronic accounting operations and release accountants from heavy manual work. The second stage, where financial software mainly developed, was started in the mid-1990s. The Chinese accounting software companies shifted their focus to financial software, in order to fulfil the financial management demands of Chinese organizations. In the late 1990s, the domestic software industry was reoriented towards the development of integrated ERP applications, which expanded the accounting and financial software to include production, supply, human resource and other business functions (Xue, Liang et al. 2005). The most dominant local vendors, UFIDA and Kingdee, have both developed through accounting and financial software companies (Wang, Xu et al. 2005).

Domestic ES vendors are putting a lot of effort into the development of ES systems with unique Chinese characteristics. The format and the standard of financial-related reports have been enacted by Chinese government authorities. Some of the modules were designed specifically to meet Chinese accounting regulations, for instance, UFIDA’s reporting module generates reports that are formatted in accordance with China’s National Accounting Regulations (Xue, Liang et al. 2005).

The review of the evolution of domestic ES (ERP applications) indicated that government involvement is clearly visible in the form of policies, regulations, and research funding (Brown and He 2007). China is under the governance of a central administrative system. The government’s recommendations have a huge impact on corporate strategy, planning and decision making. Tracing back to the 1990s, in order to respond to government advocacy, many companies initiated computerization via the installation of a standalone accounting system in the
accounting department. This actually created vast opportunities for local vendors to enlarge and consolidate their market share (Brown and He 2007). This historical perspective can partly explain why international vendors fail to dominate Chinese ES vendors. A number of local vendors had already established their brand and reputation in the accounting and financial software fields before they reoriented into the ES (ERP) field. Based on the previous IS experience, many Chinese firms tend to trust local ES vendors more than foreign ones (Xue, Liang et al. 2005).

Some researchers also indicate that there were only a few attempts to develop MRP systems in China, while accounting and financial products were booming (Wang, Xu et al. 2005; Brown and He 2007; Ge and Voss 2009). However, these attempts were not made in the manufacturing field but were initiated in universities’ research programs. These domestically developed MRPII/ERP prototypes were capable of only limited functions; however, their unbeatable low prices still drew attention from Chinese SME companies which required uncomplicated business processes (Wang, Xu et al. 2005).

3.2.4 The motivation of ES adoption in China

A famous quote made by (Davenport 1998) is that ‘ERP is not only a software package but also a way of doing business’. Thus, the best use of an ES (ERP) application requires the knowledge of not only the technology itself, but also of the organization in which the technology is embedded. In the ES procurement literature, researchers advocate the necessity to ensure that ES systems are acquired in accordance with the overall business vision of the organization (Poon and Yu 2006). Researchers in the ERP implementation field regard the appropriate understanding of ‘the concept of ERP’ as a critical success factor (CSF) (He 2004). They found that under the centralized economic environment, Chinese business executives tend to regard ES (ERP) as more of a pure technical issue than of a business opportunity. In this circumstance, the decision of ERP to make a disconnection with corporate strategy and become a standalone IT project is deemed to fail, unless some strategic manager can re-evaluate and reorient ES adoption as an overall corporate innovation practice. A rational motivation for an ES adoption is always the right way to begin of an ES journey of exploration;
Zhang, Lee et al. (2005) also advocate that ‘the motivation to adopt ERP’ is a critical success factor in scrutinizing ES success/failure in China. Heeding this warning, the study summarized primary motivations of Chinese organization’s ES adoption into two aspects: (1) external institutional push, and (2) internal business demand.

- **External institutional push**

The Chinese economy is a highly centralized administrative system. Government plans and institutional regulatory dominated all walks of national industry of the whole country. IT sometimes is thus more a planning driven project rather than a business driven project (Zhao and Grimshaw 1992). The Chinese manager’s desire to use IS in an organization may be not as strong as the central planner’s desire. Zhang, Cecez-Kecmanovic et al. (2008) describe a vivid case of an ES adoption in a big SOE. The ES project was initiated by government to embark on a national ‘Computer Integrated Manufacturing Systems project’ (CIMS project). The Government invested partially in the project and encouraged these trial companies to invest additional money themselves in order to adopt the ES systems. The implementation approach was ‘top-down pushing’ from the Government to the parent company, then to divisions and subsidiaries. Two divisions which were purely pressured by their parent company have reported not so successful outcomes of the adoption, since they were not driven by real business reasons.

In some Chinese joint ventures, ES implementation is a mandatory requirement from foreign investment. On the one hand, the Chinese partner has to renovate their old fashioned operational processes to meet foreign counterpart demand (Ma and Loeh 2007). On the other hand, the companies that come from overseas have a strong need to have those systems implemented to give them strong control and visibility (Trombly 2006).

- **Internal business demand**

In this decade, Chinese companies are facing tougher competitive challenges than those of many of their western counterparts, due to a radical change in their external environment (Ma and Loeh 2007). Chinese managers have increasingly started to look towards IT as part of a wide business modernization of their
processes and management models, in response to the fierce domestic and international competition (Reimers 2003; Woo 2007). For example, state-owned enterprises suddenly realised that they had to compete with international counterparts in the global market, due to China’s entry into the WTO and other government policies. In these circumstances, Chinese companies started to appreciate the concept of Enterprise Systems, and initiated the adoption of ES to facilitate organizational, strategic and/or structural innovation, in order to survive in the new, dynamic market (Ma and Loch 2007).

Currently, some large enterprises are looking toward global expansion and a listing on foreign stock exchanges. These large enterprises need to comply with international standards, adopt better IT and business practices, and improve their corporate governance and business outcomes to increase shareholder value (Ganly and Dharmasthira 2008). According to a large survey of Chinese executives in term of ES implementation, regardless of the ownership of organizations, all the participant companies’ implementation are driven by business purpose (Reimers 2003). Specifically, SOEs are more interested in improving management controls and adapting business process to international best practice, whereas the purpose of non-SOEs is to reap more financial benefits.

3.3 The misalignment between the ES package and the Chinese context

Researchers conclude that the unexpected high failure rate of ES projects in Chinese organizations is usually the result of management issues rather than of technical difficulties (Shue, Chae et al. 2004). Top-tier international vendors who found difficulties in leveraging their technology and capital advantage in Chinese market provide compelling evidence for this conclusion. Through an extensive review of studies on Chinese ES implementation and adoption, the misalignment between ES package systems and the Chinese context is one of the critical management issues hampering ES success and future efficient assimilation in the post-implementation stage.
Misalignment (Soh and Sia 2004), misfit (Soh, Kien et al. 2000), or poor ‘organizational fit of ERP’ (Hong and Kim 2002) all pertains to the phenomenon of incompatibility between ES package system and the adopter’s context. (Hong and Kim (2002) defines ‘organizational fit of ERP’ as ‘the congruence between the original artifact of ERP and its organizational context (p.27)’. Soh and colleagues at the meantime delineate misalignments and misfit as differences between the package and the structures embedded in the organization (as reflected by its procedures, rules and norms) and the structures embedded in the package(Soh and Sia 2004).

Soh, Kien et al. (2000) observed a worse ‘misfit’ phenomenon in the Asian context, because the underlying structure of most ES systems is influenced by US and European business processes, which in many cases are substantially different from those prevalent in business in Asia. Those differences arise from various levels in a context, ranging from specific company to country level. Davison (2002) and Newman and Zhao (2008) also contend that the western ES system ignores some of the most cherished traditions and practices in China, such as access to information, meanings of numbering systems and the different perceptions of empowerment and reengineering. Similar to Davison’s argument, Avison (2008) argues that, the current popular solution of multinational ES implementation, which is to roll out a global template in difference countries, is not without risks, because it does not take into account the local environment and may lead to the severe misfit issue.

This section synthesizes a variety of misfit issues between package ES applications and the Chinese context. A couple of researchers have identified misalignment at the application level. They found frequent misalignment appearing in the form of incompatible technical features including data form, system functions, system output format and user interface (Soh, Kien et al. 2000; Hong and Kim 2002). The second type of misalignment is attributed to differences between the ES’s embedded business model and conventional Chinese business practice. It reveals the further in-depth misfit between two distinct enterprise management and operational systems prevailing in China and the western counterparts. The third misalignment is the discrepancy between ES complexities and the current level of IT maturity in Chinese context, and we argue there is an explicit gap between the
requested IT maturities by ES system and the current state of Chinese organizations. We conclude that, given the existence of all kinds of discrepancies between ES and Chinese organizations, the radical change initiated by the ES package is not so welcome by Chinese organizations. This unwelcomed radical change may result in resistance and negative attitudes towards ES systems in some Chinese organizations.

3.3.1 ES misfit from the perspective of software application

ES is a type of complex packaged solution that is not tailored for specific needs for a particular organizational context. The ES package provides a generic solution with purported ‘best business practice’ that dictates how a company structures its organizations, production and management (Sathish and Pan 2007). ‘The best practice’ reflect an idea of ‘technical fix’ (Swan, Newell et al. 1999) that vendors are keen to adopt. The technical suppliers perceive the technical artifacts as a fixed physical entity in which parameters have been defined, codified and packaged, in other words, the design of such technology could (or may be) relatively independent of the context where they are used (Swan, Newell et al. 1999). Following this ‘technical fix’ idea, ES packages prescribe clients with a procedural vision and the means for segmenting, organizing and carrying out work in contemporary enterprise settings (Kallinikos 2004). In an ES package, these procedural and segmented works are then codified as data, process, and transactions within and across functions of an organization. Therefore we can demonstrate the misalignments in the technical level from a traditional software application perspective.

Soh, Kien et al. (2000) examine the ‘misfit’ issue in line with the software application lens, identifying three categories: data, process and output. Hong and Kim (2002) operationalized a similar ‘misfit’ construct - ‘organizational fit of ERP’ - in terms of data, process and user interface. Moreover, the authors also demonstrated a significant effect of organizational fit on ERP implementation success by empirically testing. According to these previous studies, there are three forms of misfit described below.
Data misfits arise from incompatibility between organizational requirements and the ES package in terms of data format and relationships among entities as represented in the underlying data model (Soh, Kien et al. 2000). For example, the ES package must be equipped to handle double-byte characters, since written Chinese is not alphabet-based (Trombly 2006). There are also cases where Chinese names or terms go beyond the defined number of characters in the data field in the ES system (Soh, Kien et al. 2000).

Process or functional misfits arise from incompatibilities between organizational requirements and ES packages in terms of the processing procedures required (Soh, Kien et al. 2000). This type of misfit is also titled ‘feature-function fit’ (Goodhue and Thompson 1995; Sathish and Pan 2007), mainly pertaining to the extent to which the internal organizational functionality can be supported by the external package features. When a large number of user requirements are missing from the system, a low alignment between system features and organizational functions exists.

Output/interface misfit arises from incompatibilities between organizational requirements and the ES package in term of presentation format, information content and user interface design (Soh, Kien et al. 2000; Hong and Kim 2002). This misfit is a crucial one in Chinese companies. Take financial modules as an example: China implements very different accounting and taxation systems compared to the West. In this case, the misfit of financial report content and format cause great difficulties in implementing international ES packages (Brown and He 2007), and a number of Chinese companies prefer to choose local systems that are compatible to the national financial system (Xue, Liang et al. 2005; Trombly 2006; Ge and Voss 2009).

3.3.2 ES misfit from the perspective of management model
Yusuf, Gunasekaran et al. (2006) ascribe the poor fit between ES and the Chinese company to a fundamental incompatibility between the prescribed ES business model and traditional Chinese management systems. A director from a Chinese ES adopter contended that ‘it normally take years to change management prior to putting on any enterprise system in China’ (Trombly 2006). In China, the
traditional business and production system is conducted in a unique way, where decisions heavily rely on manager’s experience and intuition, management information is communicated through hard copies of reports, manufacturing is based on traditional planning system (Wang, Xu et al. 2005), and production plans are revised much more frequently (Brown and He 2007) than western counterparts. All this denotes a gap between ES embedded practice and that of Chinese organizations.

The bulk of ES (ERP) implementation studies have identified a list of issues that reflect this type of profound misalignment between ES packages and Chinese organizations in terms of management notions and style. It is noticed that Chinese managers and ES users have different perceptions on ES (ERP) concept, information sharing, strategic decision making, task standardization and empowerment, and so on, whereas those issues are emphasized by the ES package or believed to be the primary benefits delivered by ES. It is interesting to know the perceptions of Chinese managers in terms of these issues.

3.3.2.1 ES (ERP) concept

He (2004) argued that the ‘basic ERP concept’ is a China-specific critical success factor of ES (ERP) adoption which calls for fundamental changes in terms of people, organization, and culture in the adoptive company. However, much literature points out that, under centralized economic environment, most Chinese business executives tend to regard ES (ERP) more as a pure computer software centralized package than as a huge business opportunity (Zhao and Grimshaw 1992; He 2004; Wang, Xu et al. 2005; Xue, Liang et al. 2005; Zhang, Lee et al. 2005; Ma and Loeh 2007; Woo 2007; Xu and Ma 2008). The inappropriate notion of ERP taken by business executive causes a low-level commitment from top management. They tend to delegate the responsibility to the IT managers who, however, have no corresponding powers and influence to allocate resources, form project teams, coordinate multiple functionalities, counsel unsettled people and facilitate organizational range of changes (Woo 2007). The lack of understanding of the ERP concept among top management causes a number of obstacles of ERP adoption,
including insufficient sensitivity, lack of communication, and inner resistance, thereby decreasing the chance of success of the ES adoption.

### 3.3.2.2 Information transparency

The ERP system is designed as an open system, with all authorized users able to access most, or a part of the system (Davison 2002). In open culture, it is well accepted that employees are trusted to use information responsibly, while in other cultures, a much stricter control of information access is applied (Davison 2002; Lu and Heng 2008).

Chinese societies are based on networks of relationships (Xue, Liang et al. 2005). People value a harmonious equilibrium within the corporation system and respect the hierarchical authority (Avison and Malaurent 2007; Avison 2008). The reason that people tend to maintain a harmony is to moderate bureaucratic hurdles and to reduce the transactional costs. ERP and ERP-enabled information sharing and openness conflict with the fundamental Chinese value of retaining harmony, so information transferring and release are rather different compared to the West.

Firstly, Chinese prefer to transfer knowledge through interpersonal contract rather than through formal and written means. This informal communication manner defies the information codification and openness prescribed by information systems (Lu and Heng 2008). Meanwhile in the Chinese context, the meaning of a message always depends on its context and its content; therefore, data and information will lose much of their meaning if they are encoded in a simplified form and deprived of the context (Martinsons and Westwood 1997; Martinsons and Hempel 1998). Besides, the released information is selective and incomplete. It is always encouraged to release information that promotes conformity and suppresses the information that undermines stability (Xue, Liang et al. 2005).

Information control is also related to organizational power in the Chinese hierarchy management structure (Martinsons and Hempel 1998; Davison 2002; Lu and Heng 2008). Critical information is one of the predominant sources of power in China: this is kept as a personal asset rather than as an organizational resource (Martinsons and Westwood 1997). Key information and knowledge are selectively passed to the chosen subdominant rather than distributed widely. As ES adoption is accompanied
by information transparency, Chinese management might feel uncomfortable with this information disclosure.

Although Chinese perceive information transparency in a different way, information sharing may be one of the great impacts delivered by ES to Chinese organizations, if it helps Chinese enterprise to discard the old conventions of over-protection of information, and to embrace a more open information culture and transparent management practice.

### 3.3.2.3 Decision making

The decision making mode in the Chinese business context is also misaligned in the way that the ES prescribe. ES facilitate better decision making by providing timely, accurate and reliable data (Shang and Seddon 2002; He 2004). The Chinese entrepreneurial model of strategy making relies on personal knowledge and intuition rather than on dry data, objective criteria and qualitative methods (Lu and Heng 2008). Meanwhile, the decision making process involves only a few people and takes a very short time to make (Martinsons and Hempel 1998). It is also noticed that decision making in Chinese organizations is highly influenced by institutional dictation. As mentioned before, a number of SOEs which ES adoption projects were dictated and subsidized by government. It is acknowledged that institutional regulation and policy play an important role in directing management decisions, especially in Chinese state owned enterprises.

However, there are voices suggesting that an ES sort of system is suitable for a highly centralized decision making style context (Morton and Hu 2008). On one hand, ES might increase centralization as it provides a strategic manager with accurate and reliable evidence generated from shop floor level. ES makes a lot of hidden issues visible, strengthening the centralized control. On the other hand, ES facilitates the establishment of a more structured corporation government mechanism, which can reduce the possible risks caused by arbitrary dictates of the top manager.

### 3.3.2.4 Business process

Morton and Hu (2008) argue that ‘in the context of ERP adoption, organizations that have a low level of business integration and relatively non-standardized work
processes will encounter higher resistance from within, as the ERP pushes the organizations to integrate functions and units and adopt the standardized business process embedded in the system’. However, Chinese companies lack formality in business process and planning (Martinsons and Hempel 1998), represented as informal information transferring, reliance on networking and relationships, and intuitive decision making as discussed above. The ES applications, which emphasize planning, standardization and elaborate procedures (Kallinikos 2004), therefore place a heavy burden of adaptation and reengineering on Chinese companies where business process often vary markedly from the West (Yeh, Miozzo et al. 2006). It is also noticed that, in a great number of Chinese manufacturing enterprises, there is a lack of equivalent technical terms and standard parameters in production practice, exactly matching those used in the ERP/MRP package (Wang, Xu et al. 2005). As a conclusion, Ma and Loeh (2007) observe, ‘Chinese company are more familiar with the operational model developed in the planning-oriented economics than the market-based operation model’.

The ES package also is characterized by cross-functionalities, which enables a unified vision of firms and force organizations to move away from function-based systems towards process-oriented integrated systems (Al-Mashari 2003). Other scholars believe that ES increases inter-department coordination and promotes ‘interdependence’ across functionality units. This task interdependence notion seems to align with the Chinese value of harmony; however this is simply not the case. A number of scholars point out that, under the broad umbrella of collectivism, the Chinese value an ‘individualistic collectivism’ (Lu and Heng 2008) where small group or family values and interests are emphasized and protected, rather than holistic society-oriented value (Marble and Lu 2007; Lu and Heng 2008). Therefore, a coordinated behaviour across departments is not attained easily in Chinese organizations as assumed, so when ES imposes such interdepartment coordination in the context and overrides vested interests within a group, resistance probably occurs in the company.

The ES package dictates standardization by redefining responsibilities and clarifying job roles in each step of the procedural chain in a corporation business
process. Thus, employees need to acquire new knowledge and are further delegated responsibility to make decisions. It is not appropriate to assume that all people in different contexts welcome the empowerment (Yusuf, Gunasekaran et al. 2006). In the Chinese context, where people get used to centralized administrative system, there is considerable reluctance to accept these empowerment initiatives (Davison 2002). It is a normal phenomenon that ‘many clerical staff at the bottom of the hierarchy feel much safer if they are told what to do and informed what is expected (Davison 2002).’

3.3.2.5 Attitude towards management change

As so many misfit issues arise from the incompatibilities between the ES package and Chinese organizations, radical changes towards management and business process are required in ES adoption. (Shue, Chae et al. 2004; Yusuf, Gunasekaran et al. 2006; Woo 2007; Xu and Ma 2008) suggest that to take a full advantage of ES software, business process reengineering (BPR) is a prerequisite. BPR is defined as ‘the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporise measures of performance, such as cost, quality, service and speed’ (Hammer and Champy 2001). The definition of BPR indicates that ES is inevitably accompanied by radical changes that challenge existing organizational cultures and conventions, and that arguably undermine the current authority and power in the company.

Accumulated literature demonstrates that Chinese people’s perceptions seems to be more positive towards change and towards new technology when they have the chance to experience it (Lu and Heng 2008). The transition to a market-driven economy in the past 30 years has brought so many changes to Chinese people in all walks of life, which has led to Chinese become accustomed to and being flexible in relation to many kinds of changes.

However, when Chinese are confronting radical change, if they do not expect it and are not prepared, resistance will be widely observed, such as in the scenario of ES adoption. ‘People will then use relationship, power or other approach to stop the IS implementation’, as suggested by (Lu and Heng 2008). Shanks, Parr et al. (2000) also comment that ‘change management in the Chinese context is not important.
Change is accepted if it is demanded’. In a context where harmonious equilibrium is pursued, people are more in favour of mild, stepwise and incremental change, rather than a disruptive and rapid one.

The success of local vendors provides compelling evidence for this argument. UFIDA, the one top local vendor in the mainland Chinese ES market, developed a strategy to assist clients to implement and assimilate their ES software smoothly without rough disruption (Liang and Xue 2004). UFIDA acknowledged that most Chinese organizations dislike dramatic organizational transformation, and they opt for incremental transitions by using a few mild transforming strategies such as ‘business process improvement, optimization and reengineering (BPIOR)’. In (Liang and Xue 2004)’s case study, a research fellow at UFIDA contends:

BPR is like an earthquake for Chinese companies. The managers and employee may not be ready for such a massive change… They can cause damages to Chinese companies rather than raising these companies’ management level (p.409).

The same observation has been made by scholars from Taiwan. Yeh, Miozzo et al. (2006) indicate that local vendors attain competitive advantages by demonstrating ability to meet special requirements of local market.

3.3.3 The misfit from the perspective of IT immaturity in the Chinese context
There is an implicit gap between ES and the Chinese market due to the technical complexity of ES and the immaturity of Chinese organizations in terms of using technology. This gap tends to be hidden by all the headlines on China about tremendous boom and investment in this market. However, China is still in the midst of development. Information technology has still not reached its final development stage, compared to developed countries (Ge and Voss 2009). It is observed that the actual market for many IT products and services in China is surprisingly small; especially in the market for many IT solutions designed for enterprise use, the results can be very disappointed (Hayward and Wiggins 2006). One of the major reasons for the setback of IT enterprise solutions is that China is still a developing economy which relies heavily on its abundant source of low-cost labour. Only a few organizations confronting ever increasing competition address
the need to utilize advanced technology to gain new competitiveness as a substitution for reliance on low-cost labour and manufacturing low-value-added products.

A general rule observed is that the more sophisticated the level of the software, the harder it will be to sell in China (Hayward and Wiggins 2006). This argument is echoed by a lot of complaints made by Chinese organizations that ‘ERP is too expensive, too complicated and risky’ (Ge and Voss 2009). A number of studies have also listed technical complexity, high price and massive IT human resources demanded as obstacles hampering Chinese organizations from adoption ES systems (Ping and Grimshaw 1992; Shue, Chae et al. 2004; Zhang, Lee et al. 2005; Yusuf, Gunasekaran et al. 2006). Currently, many companies can effectively allocate a large budget amount for purchasing ES software and related hardware, but they underestimate the effort needed by other important type of works related to ES, such as a longer period business process redesign (Newman and Zhao 2008), more time for data cleansing and transfer (Shanks, Parr et al. 2000), more communication between vendor, consultants and internal staff (Avison and Malaurent 2007), and more training efforts required in the overall lifecycle of a ES project (Zhang, Cecez-Kecmanovic et al. 2008). We argue that the extra effort required by Chinese organizations in ES adoption is due to inexperience and immaturity of using sophisticated Information, and this is more critical in the scenario of ERP softwares adoption.

Firstly, data accuracy is not a given in Chinese organizations whereas this is not a big issue in other contexts. In (Shanks, Parr et al. 2000) comparative case study, data accuracy is an important issue bothering the Chinese organization but never mentioned by its Australian counterpart. The legacy data were of rather poor quality in the Chinese firm, which incurred extra time for data-sorting before transferring data to the new ERP system. Nevertheless, the author noted that the quality of data influenced the overall integrated environment of the ERP system in the stage of system stabilisation afterwards. Brown and He (2007) also contend that the readiness of the data for ES system is a problem in Chinese organizations. Data format and content accuracy have been singled out as a critical issue in their study.
Moreover, failure of ES projects have been reported due to inaccurate data after go-live as well (Brown and He 2007; Zhang, Cecez-Kecmanovic et al. 2008).

Chinese organizations are often more dependent on external parties’ technical support due to lack of internal qualified IT staff to deal with such sophisticated IT projects. Zhang, Lee et al. (2005) suggest that both the vendors support and the consultant’s efforts are critical in the Chinese context, especially to international vendor’s, as they need local partners to bridge social and cultural gaps between Chinese clients and their practice and products (Liang, Xue et al. 2004). Evidence shows that Chinese organizations are favourable to using local consultants when they choose foreign ES products (Brown and He 2007), as local consultants are knowledgeable with functions and products and are aware of the misalignments between Chinese business and the business processes embedded in the system. The disadvantageous position of foreign vendors in China demonstrates insufficient effort from international firms to adapt their products to the Chinese market.

In spite of the IT professionals, it is a long term task to establish a learning approach to educate qualified end users, to encourage appropriate usage and to transfer the knowledge from proficient user to novice. In Chinese organizations where there is lack of the necessary learning and changing environment, resistance to the ES is implicit yet hard to defy (Zhang, Cecez-Kecmanovic et al. 2008). End users keep telling of the mismatch of user requirements and technical problems yet are reluctant to deal with this problem with IT professionals (Avison and Malaurent 2007). The compliant Chinese users nominally support the project, but in fact they do not take the training and participant opportunity seriously (2008). This will eventually result in data of poor quality, inappropriate system configuration, and misalignment between user requirement and software. All this accumulated passive attitude and overt or covert resistance will result in a failure situation.

Ma and Loeh (2007) argue that ES-driven organizational innovation is evolved through a learning process over time, ‘An effectively designed learning mechanism could support companies to build up their needed organizational and managerial processes’. They suggest that a learning mechanism in the ES scenario should include experience accumulation, knowledge articulation, and knowledge
codification. Zhang, Cecez-Kecmanovic et al. (2008) even advocated a mandatory approach that encourages ES end user involvement and promotes an ES training program. They introduce a case where the ES training effect connects to the employee’s bonus; therefore, all the involved employees have to attend and pass the ES training. In conclusion, ES involves technology, people and functions. When we are talking about sophisticated technology, we cannot afford to overlook the people who will work with the system. End users with fixed mind-sets and of poor quality, who are conservative to change and passive to learn, represent one of the major obstacles to fully realizing the potential benefits of ES.

3.4 The source of misalignment: Context variables affecting ERP success in Chinese context

Soh and Sia (2004) propose a conceptual framework built on key concepts from the theories on the institutional and structurational properties of technology, to identify the source of package-organization misalignment and their influence on the organizational choices for resolving the misalignments. The author argues that ‘the contextual differences between the package and implementing organization should be explicitly considered as important source contribute to the misalignments…Unreflective use of the technologies where there are major mismatches between the assumptions and rules embedded in the technology and in the use context have resulted in disastrous outcome (p.377)’. In (Soh and Sia 2004)’s misalignment framework, there are two major contextual sources jointly shaping current organizational structure of the implementation company, then subsequently causing the mismatch between package software and implementing organizations. One type of source comes from external authoritative pressures imposed on the organizations (Scott 1988). The institutional pressures are exerted by ‘the coercive authority of nation states’ (DiMaggio and Powell 1983), through laws, regulations (Soh and Sia 2004), and the requisite structures (such as national culture) that organizations inherit, comply and remained in their structure. Besides national coercive pressures, another kind of authoritative resource is exerted by professionals and industry that the organization belongs to (DiMaggio and Powell
1983). This ‘normative authority’ includes but is not limited to professional conduct, industry accreditation, standards or rating system established by industry associations.

Although the national, industry and professional institutional dictation influence the shape of an organization’s structure, an economic entity is always able to find a variety of strategies to ‘negotiate, persuade, and debate’ (Orlikowski 2000) with the institutional environment. That is, organizations are likely to have more leeway in choosing an appropriate structure based on their own interests and conditions; in other words, organizations can adopt structures voluntarily to find a niche and gain a unique competitiveness.

This extended institutional perspective is very useful in interpreting the misalignments identified between the ES package and Chinese organizations. This perspective is instructive as it provides us with solutions in counselling in relation to the misalignments. Based on (Soh and Sia 2004)’s framework, it is rational to identify two types of contextual variable influencing the package-organization misalignments in China. One is the institutionally imposed contextual variable, including the national economic environment (Xue, Liang et al. 2005), government policy/regulation/legal requirements (Shue, Chae et al. 2004), national culture and language (Shue, Chae et al. 2004; Avison and Malaurant 2007; Ma and Loeh 2007), and enterprise ownership (Reimers 2003). The second type of contextual variable is voluntarily acquired by organizations, including management style and structure (Reimers 2003; Shue, Chae et al. 2004; Morton and Hu 2008), organizational-specific technical experience (Soh and Sia 2004; Ma and Loeh 2007; Zhang, Cecez-Kecmanovic et al. 2008), internally technical resource and labour skill (Shue, Chae et al. 2004; Xue, Liang et al. 2005; Ma and Loeh 2007). As described in figure 3.3, the two types of contextual variables cause a variety of misalignments between ES package and Chinese organizations.
3.4.1 Institutionally imposed contextual variables

As figure 3.3 shows, in the scenario of Chinese enterprise system misalignment, the most influential institutionally contextual variables are related to the economic environment, government policy, national culture and enterprise ownership.

3.4.1.1 Economic environment

China is still a developing country and is currently experiencing a transition from a central-planning-driven economy to a more market-driven economy. Due to intensified economic reforms, Chinese companies are now facing radical market and environment change. Responding to fierce competition in both domestic and international markets, Chinese organizations have initiated an ES-driven process innovation program to meet internal and external requirements. However, Chinese organizations started their initiation of IT nearly 20 years later than the West, and the background of IT development is quite different as well (Zhao and Grimshaw...
Measuring IS Success in China  

The disadvantageous economic foundation naturally forms an enormous gap between the immaturity of IT infrastructure and computing environment in Chinese enterprises and the sophisticated ES package and solutions. It is noticed that the tangible gap in terms of IT development has been gradually filled as Chinese enterprises manage to reallocate the IT budget for IT products procurement and upgrade, whereas the intangible gap in terms of IT knowledge, IT learning mechanism, user and IT professionals’ credibility and attitudes of top management toward IT-driven management change is still urge.

Meanwhile, Chinese organizations face a dynamic environment change: to cope with ever-changing market requirements, many firms have to revise business plans every two years. Nevertheless, it is not a rare case that a start-up business realizes tremendous expansion in only a few years. This rate of change and quick expansion means that ‘one-model-fits-all’ or ‘one stop shopping’ is not realistic for these Chinese businesses; hence a flexible system which is easily to customize to the dynamic business practice is required in those companies.

3.4.1.2 Political and regulatory factors

Government policy and legal requirement are very crucial institutional contextual variables that underscore the uniqueness of the Chinese context. In China, government regulation and dictation supersede organizational goals (Zhang, Cecez-Kecmanovic et al. 2008). Shue, Chae et al. (2004) identify a unique variable related to diplomatic relationship. Taking ES projects involving both Mainland China and Taiwan as example, current packaged ES cannot support transactions between two regions, as both counterparts have imposed strict regulations on transporting goods, exchanging information and so on. Such political and regulatory factors cause a misalignment between packaged software and practical business operations. Nevertheless, these institutional forces are not likely to be overcome or worked around; the only way is to localize packaged software to accommodate this institutional variable.

In spite of the political factor, China government regulations play an important role in shaping organizations’ economic activities. The Chinese economy is a highly administrative system and different kinds of government plans and dictations
dominate the national industry of the whole country (Zhao and Grimshaw 1992). The tax policies, accounting regulations and importing/exporting processes differ from those of Western countries. All these national regulatory norms and standards require the conformity of software products in terms of data format, output content and report format. Chinese organizations will purchase ES which are compliant with these institutional variables; otherwise, system customization is necessary.

### 3.4.1.3 National culture and language

Chinese culture is the most popular lens through which the IS misalignment issues are interpreted. Hofstede’s national culture model is the most frequently cited in explaining cultural influence in relation to IS usage and implementation. Hofstede’s model has been criticized for being oversimplified and too dated to live up to the ever changing business context after decades of innovation and IT diffusion through societies (Shanks, Parr et al. 2000). Studies by (Martinsons and Westwood 1997; Martinsons and Hempel 1998) have instantiated Hofstede’s culture criteria within the context of Chinese IS management. The criteria provided by (Martinsons and Westwood 1997; Martinsons and Hempel 1998) link the Chinese management model with national culture, which is instructive in discerning misalignment between packaged ES and Chinese organizations. Table 3.1, adapted from (Lu and Heng 2008), presents both Hofstede’s culture model and the culture dimensions of Martinsons et al.

The Chinese management model is instantiated with national cultural attributes. For instance, the long power distance (the strongly hierarchical power structure) together with individualistic collectivism largely influences Chinese ES users’ attitudes towards information transparency. The long power distance demands a strict information control strategy in Chinese organizations, since the top management tend to regard critical information as a source of power and authority and therefore restrain information openness. Individualistic collectivism also hampers the information sharing across groups and functionalities, as people tend to over-protect the interest of the family-based unit and are reluctant to disclose information to other units. Another example is business process standardization in line with ES system adoption. Martinsons and Westwood (1997) note that the
traditional operational processes in Chinese manufacturing companies were lack of stability, formality and documented standard. The national culture of uncertainty tolerance is arguably related to the unstructured business process. Introducing an ES system entails an opportunity to transform the old-fashioned Chinese management model towards a scientific, standardized and integrated one. Because of the national culture and characteristic, the change might not be welcomed in the first place and a lot of painful resistance has taken place in many Chinese firms, but we argue that the reform of Chinese management is necessary and worthwhile, and is one of the significant and profound impacts received from enterprise systems.

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<th>Hofstede Culture criteria</th>
<th>(Martinsons and Westwood 1997) culture dimensions</th>
<th>Attribute in Chinese context</th>
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<tr>
<td>Masculinity/ Femininity</td>
<td>Relationship to the environment</td>
<td>Harmony maintenance</td>
<td>Guanxi and face oriented, personal trust, relationship-based society, indirect expression, people born unequal</td>
</tr>
<tr>
<td>Individualism/ collectivism</td>
<td>Fundamental social units</td>
<td>Collective</td>
<td>family oriented, individualistic collectivist</td>
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<tr>
<td>Power distance</td>
<td>Management structure</td>
<td>Hierarchical</td>
<td>Long power distance, bureaucratic and centralized, high information control, top-down directive and bottom-up report</td>
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<tr>
<td>Uncertainty avoidance</td>
<td>Uncertainty tolerance</td>
<td>High</td>
<td>Adapt to uncertainty</td>
</tr>
<tr>
<td></td>
<td>Attitude to change</td>
<td>Conservative</td>
<td>Respect and preserve tradition, passive to change</td>
</tr>
<tr>
<td></td>
<td>Decision making approach</td>
<td>Intuitiveness and non-rule-based</td>
<td>Flexible and holistic intuition, high context</td>
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</table>
Table 3.1 National culture dimensions (adapt from (Martinsons and Westwood 1997; Lu and Heng 2008))

Language is another crucial contextual variable largely related to the package-organization misalignment in the Chinese context. Language difference leads to a misfit in term of data form in some ES packages (Shue, Chae et al. 2004). Some ES products cannot support multiple double-byte language (e.g. Mandarin or Japanese) and single-byte language (e.g. English) at the same time. Hence, this technical limitation forces the data entry into the ES system to be in English primarily, which does not meet the requirement of Chinese organizations where Mandarin is the official language (Shue, Chae et al. 2004).

Language differences also result in a communication barrier, which is far more difficult to overcome (Avison and Malaurent 2007). In some multinational ES projects, some key Chinese employees who are not proficient with English felt that they have been left out and that the communication with foreign ES experts was inefficient (Avison and Malaurent 2007). Moreover, the language issue will affect system manual documentation and training programs (Shue, Chae et al. 2004), since it is not an effortless task to translate documents and tailor training programs for local needs.

3.4.1.4 Enterprise ownership

Enterprise ownership is probably one of the most unique China-specific variables influencing the package-organization alignment (Reimers 2003). China has a somewhat special role as different ownership structures can be found side by side. This includes state-owned enterprises (SOE), foreign-invested enterprises, and privately held companies. Moreover, larger companies as well as major internationally operating companies may be distinguished from small and medium sized companies (SME) (Shue, Chae et al. 2004). A bulk of evidence shows that ES implementing/usage results vary among firms with different ownership characteristics (Martinsons 2004; Yusuf, Gunasekaran et al. 2006; Ma and Loeh 2007; Ge and Voss 2009). Non-SOEs tend to report more chance of success than SOE businesses. The arguable reason for this phenomenon is that the organizational structures of non-SOEs are more compatible with the structure
embedded in the packaged ES, compared to traditional SOEs. As the ownership characteristic is imposed by political factors, such as the economic system (e.g. socialism and capitalism), it is logically categorized as an institutionally contextual variable.

3.4.2 Voluntarily acquired contextual variables

According to Figure 3.1, the voluntarily acquired contextual variables include organizational structure, organization-specific technical experience and technical resources. This category of contextual variables, in contrast to those external authoritative variables which require conformity from organizations, allows the organizations to respond with an amount of flexibility and in accordance with their self interests. However, it is noted that this freedom is also under the broad umbrella of the external institution environment.

3.4.2.1 Organization structure

Morton and Hu (2008) argue that the integration and standardization imposed by most ES systems might not suitable for all types of organizations. Thus, the ‘fit’ between the characteristics of the adopting organization and the standardized business process designs embedded in the packaged ES affects the likelihood of ES success or failure. They later identified a set of dimensions of organizational structure, including (1) ‘formalization’ defined as ‘the standardization of work processes and documentation’, (2) ‘structural differentiation’ defined as ‘the differences in goal orientation and in the formality of the structure of the organizational units’, and (3) ‘decentralization’ defined as ‘the extent to which power over decision-making in the organization is dispersed among its members’. This author finally proposes that packaged ES, characterized by cross-functionalities and integration, as well as an intention of increased task interdependence and decreased task uncertainty, will be a better ‘fit’ to organizations characterized by high formalization, high structural differentiation and low decentralization.

As the organization is embedded within the institutional and national environment, therefore, the organizational structure is shaped by culture, norms and economic states, and authorities’ regulations. Originating from the country and being the
main part of the economy, the SOE type of enterprise is expected to acquire a structure in line with the institutional requirement. Hence, they tend to be: low formalization, low decentralization and medium to low structural differentiation. This type of organizational structure does not fit the structure of the packaged ES, as a previous study indicated (Morton and Hu 2008). This situation is also asserted by (Martinsons 2004), who identifies a poor fit between ES packages and the Chinese SOE context. In contrast, non-SOE Chinese enterprises tend to have a larger amount of leeway to choose a more efficient business process and organizational structure to survive in a market-driven economy. Non-SOEs, especially foreign owned/invested business, that inherit an organizational structure from the overseas parent company, are more compatible with structures embedded in packaged ES (Martinsons 2004). The different organizational structures acquired by various types of companies can give scholars a lens to interpret the discrepancy between the Chinese SOE and non-SOE in term of ES success.

3.4.2.2 Technology experience

Most Chinese companies have no ‘historic path’ in term of using sophisticated enterprise purpose solutions (Ma and Loeh 2007). SOE typically had a low pre-existing level of process automation, and existing IT applications were restricted to financial accounting and very basic inventory control (Martinsons 2004). Taking a historical perspective, the Chinese ES type of solution originated from stand-alone accounting software and gradually evolved into the ES (ERP) concept. This evolution course is largely pushed forward by local vendors who strive for survival in the dynamic Chinese ES market, rather than having stemmed naturally from the needs of Chinese enterprise. Thus, it can be safely concluded that the boom of the Chinese ES market is largely attributable to the technology suppliers’ effort in diffusing the concept of ES, and the discrepancy between the level of IT maturity in Chinese organizations and ES technology complexity has been ignored intentionally.
3.5 Summary and conclusion

This chapter reviews a large amount of literature regarding packaged enterprise system adoption and implementation in China. Three types of misalignments between packaged ES and Chinese context are identified: (1) package-context misalignment in terms of software application, (2) package-context misalignment in terms of the organizational management model, and (3) package-context misalignment in terms of organizational IT maturity. Based on (Soh and Sia 2004)’s ES package-organization misalignment source framework, the researcher then identified two groups of contextual variables with direct or indirect results in these misalignments in the Chinese context, namely, a group of institutionally imposed contextual variables and another group of voluntarily acquired contextual variables. The former group includes national economic environment, government policy, national culture and language and enterprise ownership, while the latter includes organizational structure and organization-specific technical experience.

The various sources of misalignment indicate that varying strategies should be employed to deal with the problem of package-context misalignment. Rather than a pure ES adaption solution or a pure organizational process change solution (e.g. BPR), a mutual adaption of both packaged software and the implementation organization are advocated. The literature suggests that discussion regarding what solutions Chinese organizations and ES package developer can employ in order to minimize the misalignment issues depends on which type of contextual variables invoke the incident of misalignment. Specifically, on the one hand, if the misalignment is caused by institutional variables, such as government regulation or political issue, package localization and customization probably is the only feasible solution. On the other hand, if the misalignment is caused by voluntarily variables, such as lack of technical experience and top management style, then there is leeway to negotiate for organizational change or software customization. In this scenario, the organizational process change should be encouraged, as a large scale software modification will increase project risk and considerable difficulties in system upgrade and maintenance. Moreover, reliance on software customization precludes
a valuable opportunity in terms of business model modernization and reform in Chinese organizations.

The three types of misalignments have respective implications for the IS-Impact phenomenon in China. Firstly, the misfit with regard to software application suggests which technical attributes of Enterprise Systems should be strengthened in order to fulfil Chinese users’ requirements. The contextual variable of language indicates that Chinese users demand a fully translated software, manual documentation and training material. Chinese users will be more satisfied if they can work in a Mandarin-context interface, or a system primarily in a Mandarin environment yet compatible with multiple languages. Besides, the variable of authorities’ regulation significantly suggests the importance of software localization when a foreign-developed package is introduced to a new market. The ES package must provide localized configuration alternatives to satisfy local clients’ requirement. Moreover, the economic variables raise another question about the value of packaged ES in the Chinese dynamic environment that rewards flexibility rather than efficiency. We argue that, in the current Chinese context, gaining organizational agility is at least as important as the improvement of efficiency. Hence, Chinese organizations might value a flexible system that can be easily customized or extended along with the corporation’s developing lifecycle.

Secondly, the misfit in light of the management model differing between packaged ES and the Chinese context indicates where the technical artifact will generate critical impacts on Chinese adopters. We argue that one of the great impacts from packaged ES is to reshape Chinese organizational structure and to change management conventions. The diffusion of packaged ES might transform the implementing organization into a new structure with higher formality and lower structural differentiation, represented by high levels of standardization, process-oriented operation and smooth coordination across functionalities. In the meantime, management convention would be changed, such as establishing an information transparency environment, aiding data maintenance, facilitating a rational decision making mechanism and altering the organization-wide attitude towards organizational change.
Thirdly, the misfit between the level of IT maturity and ES technical complexity points to a major issue that influences overall packaged ES and its yielding constant benefits to Chinese organizations. The packaged software is a commodity ready to sell to any organization which can afford to purchase it. Nowadays, Chinese organizations can acquire a packaged ES of $ five million as easily as they acquired IT infrastructure products a decade ago. However, the possession of a system of good quality and advanced technology guarantees neither an appropriate system deployment nor a realization of expected benefits. What results in a payoff of the ES investment is attributable to the ES artifacts and the complementary aspects of resource and capability that the artifacts demand (McAfee 2006). Thus, we argue that, in the Chinese context, the packaged ES has to be complemented with a learning mechanism related to ES and IT maturity instantiated with competent IT professionals and users of good quality. The learning mechanism includes adequate training program and user communication sessions, purposing to articulate, maintain and pass on the ES knowledge and skills. Moreover, the training has a second benefit in changing the attitude of the user towards ES systems. Thus, a sustainable IT context can be attained and more future benefits from ES can be expected.
# Chapter 4  Research Methodology: a general inductive and qualitative approach

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4.1 Introduction

This chapter discusses the methodology, the method that is most relevant and effective to deal with the research objective and the research problems of this study. Methodology refers to the choices we make to this study, such as methods of data gathering and forms of data analysis, in planning and executing a research study (Silverman 2005). Therefore, the methodology here defines how the research will go about studying the phenomenon under investigation – the impact of Enterprise Systems on Chinese users and organizations. Moreover, methodology here is defined in a broad manner and differentiated in terms of ‘qualitative’ versus ‘quantitative’. As for other more specifically defined methods, such as grounded theory, discourse analysis and content analysis, this study prefers to treat them as specific data analysis approaches included under the broad umbrella of qualitative methodology. This chapter is structured in a way that commences with the most general issues related to research methodology, and moves to the specific research methods and analysis techniques involved. Hence, this chapter aims to clarify a series of issues related to the study:

- Demonstrating the grand research methodology: qualitative or quantitative
- Choosing the type of empirical evidence that can deal with the research objective
- Choosing the inquiry approach: induction or deduction
- Choosing the data analysis methods
- Delineating the data analysis procedure and techniques
- Demonstrating reliability of the research design

4.2 Selecting the research methodology

4.2.1 The context dependent study requests qualitative methodology

This study adopted a qualitative methodology as its primary research strategy. Qualitative research methodology is designed to help researchers to understand people and the social and cultural contexts within which they live and interact (Yin
The IS-Impact phenomenon is dynamic, complex and multi-dimensional, and may be perceived differently under different usage scenarios, requiring active exploration of each different situation. Qualitative research methods and triangulated qualitative evidence provided the researcher with a useful device for confronting such complex and context-sensitive study objects as the investigation of the IS-Impact of ES. This section discusses the rationale for choosing methodology between a qualitative approach and a quantitative approach.

The quantitative approach has been a well-established tradition in the IS discipline for several decades (Orlikowski and Baroudi 1991; Lacity and Janson 1994). Quantitative research is generally seen as theory and hypothesis testing. The assumption underlying this methodological approach is that research designs should be based on the positive model of controlling variables and testing pre-specified hypothesis alternatives (Kaplan and Duchon 1988). The role of quantitative research is also to describe the general (Hyde 2000). Quantitative methodologies seek to describe the general characteristics of a population, and tend to ignore the details of each particular element studied. Quantitative approaches often draw a large and representative sample from the population of interest; measure the behaviour and characteristics of the sample, and attempt to construct generalizations regarding the populations as a whole (Hyde 2000).

Specific to the Information Systems evaluation area, a review of literature suggests that most studies in this area tend to rely on a quantitative approach and have made substantial efforts with testing seminal evaluation models and theories, such as the DeLone and Mclean IS success model. DeLone and McLean (2003) reported 100 empirical studies that sought to validate the IS Success model subsequent to their introducing this theoretical model in 1992. Recently, Petter, DeLone et al (2008) identified 200 studies validating the conceptualization of constructs related to IS success or examining interrelationships among variables in the IS Success structural model. Those works imply that when IS researchers explore IS evaluation issues, they tend to conduct studies from one philosophy of scientific inquiry paradigm – positivism, to utilize one type of method – survey or
experiment, to produce inference on one type of reasoning process – deductive reasoning, and to collect one type of evidence – quantitative data.

However, it has been argued that a single research perspective for studying information systems phenomena and the over-reliance on a single type of method is unnecessarily restrictive (Orlikowski and Baroudi 1991), and many voices have called for qualitative approaches to supplement the quantitative approach (Gable 1994; Lacity and Janson 1994). Theorists suggest that a qualitative approach can assist in understanding relationships between information systems, peoples and organizations, and that a qualitative approach is especially beneficial to studies which are context dependent and sensitive.

Quantitative research tends to ignore the context in which the investigated object is embedded. The idea of experimental and statistical control is an essential feature of quantitative research. A good experimental design featuring simplification and abstraction will remove enough features from the subject of the study that only obvious results are presented (Kaplan and Duchon 1988). They strive for objective measures of phenomena and the admirable goal of controlling experimenter bias (Kaplan and Duchon 1988). In some circumstances, quantitative study design needs to remove the effect of context in order to produce generalizable, reproducible results. Kaplan & Duchon (1988) observed that quantitative study is ‘stripping of context to buy “objective” and testability at the cost of deeper understanding of what actually is occurring (p.572)’.

Compared to quantitative methods, immersion in the study context is a hallmark of the qualitative research method (Kaplan and Duchon 1988). Yin (1994) credited qualitative methods with this contextual immersion. He regarded one of the characteristics of qualitative research as ‘detailed observation of, and involvement of the researcher in, the natural setting in which the study occurs’ (Yin 1994). Benbasat, Goldstein et al. (1987) identified three strengths of the case study method which generally apply to all qualitative approaches: (1) the researcher can study information systems in a natural setting, learn about the state of the art, and generate theories from practice; (2) the method allows the researcher to understand the nature and complexity of the process taking place; and (3) valuable insights can
be gained into new topics emerging in the rapidly changing information systems field. These three strengths demonstrate the rationale for the employment of qualitative methods in investigating IS-impact issues in the Chinese business context.

This study is context-dependent research which moves the object of investigation beyond the previous research setting into a new context. This study is also a context-specific study, with particular interest in the uniqueness and difference of the study object when it is considered in the new context. Hence, context is a particularly interesting variable in this IS evaluation study and we assume that a great many variations of research findings can be ascribed to context. We believe that a qualitative method will be more effective for approaching context issues.

Considering that the context is influential to this study, the researcher needs to delineate how the study will approach the issue of context. Firstly, the study does not seek to operationalize contextual variables. Secondly, the study is not interested in putting the contextual factors into an experimental or survey design and empirically testing the effect of contextual variables on the study object of ‘IS-Impact’. Instead of such micro analysis of context, the study tends to employ a macro treatment to the context. Qualitative research actually provides the researcher flexibility to deal with context in a macro manner, as the fieldwork setting, research subjects and verbal/recorded text data encompass context features coherently. Specifically, the study approaches the context in two ways. On the one hand, from the perspective of research design, the Chinese context imposes an overarching influence on the study design and results: it impacts on the data gathering, analysis and interpretation. On the other hand, the context is worked as an analytic tool by which we conceptually interpret how and why the study object in a Chinese context is similar or not similar to its existence in other contexts.

In conclusion, the researcher emphasizes that the specific research objectives and research questions dictate the choice of research methodology and associated methods. This study adopted qualitative method to investigate the IS-Impact on Chinese users and organizations, because a qualitative method will better equip the researcher to investigate this context-dependent and context-specific study.
Moreover, a qualitative method is appropriate to the study on the grounds that we attempt to identify the critical IS-Impact issues from the perspective of the actual Chinese IS key users. The qualitative method facilitates the researcher to stay in tune with concurrent reflection, insights and perceptions of the Chinese user. Therefore, the study considers that the qualitative approach satisfies the study objective and is capable of yielding valid answers to our research questions.

4.2.2 The perceptual IS evaluation study seeks answers from textual data

The preceding section demonstrated the rationale for adopting a qualitative approach in this study. Moreover, when a study is committed to a qualitative approach, the researcher needs to consider further issues regarding the choice of specific methods of inquiring and specific types of data sought. No qualitative methods and data are intrinsically superior than others (Silverman 2005); however, there sometimes is a particular method and type of data more appropriate to the research problem. This section discusses the type of data sought in the study. Specifically, two further questions need careful consideration: (1) what kind of empirical evidence is appropriate to answer the research problem? (2) how can the researcher gather the empirical evidence?

If the study seeks a quantity measure, such as a monetary index, the researcher can collect financial reports released periodically, and find the needed financial indicators and monitory figures. Otherwise, if the study seeks technical parameters of the IS, the researcher can interview technical experts and solicit particular technical measures regarding IS technical performance. However, stated previously, this IS evaluation criteria study seek for qualitative, intangible, perceptual measures, rather than quantitative, tangible and technical measures. When aiming to develop such intangible evaluation measures, the study needs to enter Chinese organizations within which an Enterprise System is socially and culturally embedded. The researcher needs also to get access to Chinese users who work directly with the technology and are affected by the technology. Immersion in such a real setting allows the study to identify insightful and useful perceptual measures from interactions between users, organizations and ES.
The motivation for doing qualitative research, as opposed to doing quantitative research, comes from the observation that, if there is one thing which distinguishes humans from the natural world, it is our ability to communicate ideas through words. We assume that the important qualitative terms that respondents use to convey their feelings, attitudes, perceptions and assessment are presented in language. Hence, this study proposes to survey subjects, distil qualitative terms from linguistic data collected, and make these qualitative terms into qualitative measures which could be used in future qualitative assessment in term of IS performance and impacts.

Although the researcher might get access to the organization and gain insights by observing key users’ daily involvement with IS, this method and the data gathered would not satisfy the research objective. A qualitative method which largely relies on observation will constrain the investigation within a very limited number of individual subjects. The study results might be subjected to individual experience and can hardly reveal an overall picture of the phenomenon under investigation. Therefore, to find out a general pattern of how Chinese users conceive the salient ES features and important impacts of the ES, the researcher chose to employ an open-ended survey. The instrument containing the open-ended survey questions is carefully designed; a large number of key users who are knowledgeable about ES are purposely selected; and large chunks of textual responses to these questions are also inventoried. After an intensive content analysis of the meanings of the textual data, critical and significant qualitative terms (concepts) pertaining to IS-Impact are extracted and then transformed into perceptual measures. In this manner, this evaluation study successfully solicits qualitative assessment measures from qualitative data.

4.3 Selecting the research inquiry approach: a general inductive inquiry approach

There are two general reasoning approaches which may result in the acquisition of new knowledge in a qualitative study, namely inductive reasoning and deductive reasoning. Inductive reasoning proceeds from the particular to a generalization
It is a theory building process, starting with observations of specific instances, and seeking to establish generalizations about the phenomenon under investigation (Hyde 2000). Deductive reasoning proceeds from generalization to particulars (Krippendorff 2004): a theory testing process which commences with an established theory or generalization, and which seeks to see if the theory applies to specific instances (Hyde 2000).

Qualitative researchers might practise either induction or deduction, or even both of them, but do not always recognize these processes formally in their study (Hyde 2000). It is believed that ascertaining the formal inquiry procedure can represent an important step towards assuring conviction in qualitative research findings. This section presents a discussion on two inquiry approaches and describes the selection of an appropriate inquiry approach for this particular study.

4.3.1 The deductive inquiry approach

Yin (1994), a most cited author on case study methodology, generally stands alone in advocating a deductive approach to case study research. According to (Yin 1994), qualitative research should commence with a set of specific propositions and data is sought to test those propositions. Where data confirms, these propositions enhance confidence in the validity of the concepts and their relationship; whereas where data do not confirm, these propositions can provide an opportunity to refine the theory.

Hyde (2000) and Mayring (2000) recommend a deductive method linking data to a predicted proposition. The procedures of connecting data to theory are of central interest in qualitative research, where making datasets into categories is one of the important analysis procedures. Mayring (2000) argues that ‘deductive category application works with prior formulated, theoretically derived aspects of analysis, bringing them in connection with the text’. The deductive analysis firstly fractionates predefined theories, patterns and hypothesis into a categorization matrix which constitutes a set of predicted categories and concepts (Elo and Kyngas 2008). The next step is to code data according to the categorization matrix, also known as the codes book, codes scheme or codes map (Miles and Huberman 1994). The main idea of deductive analysis consists of a methodological controlled
assignment of the category to a passage of text. According to a given list of categories, explicit definitions, examples and coding rules for each category, the text passage can be mapped into given categories strictly under a defined circumstance.

Sedera (2005) outlines several advantages of a deductive inquiry approach. Firstly, the theoretically derived categories are generally mutually exclusive and stable, as they have been empirically tested by previous studies across time. The mutual exclusivity largely eases the data synthesis. Secondly, using existing frameworks and categories makes the findings more generalizable to a larger context; at the same time, a comparison between the findings and the prior study can be directly attained.

The same author provided a good example of top-down deductive data analysis. In order to conceptualize an IS evaluation model for gauging IS impacts from accumulated textual evidence (Sedera 2005; Gable, Sedera et al. 2008), these researchers commence their analysis from the existing IS Success model (DeLone and McLean 1992). After removing overlapping measures and non-perceptual measures seen as incongruent with the design of the IS evaluation model, the rest of the measures and dimensions of the IS Success model were retained as a code scheme against which respondents’ statements were mapped. The statement mapping helped the researchers to select appropriate dimensions and measures to build the a-priori model.

4.3.2 The inductive inquiry approach

The literature also suggests an inductive inquiry approach in qualitative research. Inductive analysis refers to approaches that primarily use detailed reading of raw data to derive concepts, themes, or a model through interpretations made from raw data (Thomas 2006). Consistent with traditions of Grounded Theory methodology (Glaser and Strauss 1967; Strauss and Corbin 1998), inductive analysis normally begins with an area of study and allows the theory to emerge from the data. Compared to a deductive inquiry approach that normally aims to test pre-existing theory, an inductive inquiry approach aims to develop the theory from the empirical data. Hence, the inductive approach is also labelled as ‘bottom-up’ and
‘data-driven’, making sense of field data (Lincoln and Guba 1985) and managing to arrange a data set into a logical classification (Sedera 2005).

The primary purpose of the inductive inquiry approach is to allow findings to emerge from the frequent, dominant, or significant themes inherent in raw data, without the restraints imposed by structured methodologies (Thomas 2006). Thomas (2006) outlines three detailed purposes underlying most qualitative studies employing an inductive approach: (1) to condense extensive and varied raw data into a brief, summary format; (2) to establish clear links between the research objectives and the summary findings derived from the raw data and to ensure that these links are both transparent and defensible; and (3) to develop a model or theory about the underlying structure of experiences or processes that are evident in the text data.

The inductive approach is superior to a deductive approach in several circumstances: (1) The inductive approach is appropriately applied where there is insufficient former knowledge about the phenomenon or if this knowledge is fragmented (Elo and Kyngas 2008). When studies move to a new context or phenomenon, an inductive approach allows researchers to stay close to a particular instance and then move from the specific to the general, finally combining the specific into a large whole or general statement. (2) An inductive approach takes account of the context-specific issues of a phenomenon (Sedera 2005), and is powerful in studies which aim to develop substantive theory representing the particular context. A theoretical framework developed in one context might or might not be generalizable to another context. A theory or hypothesis testing approach might make context-specific themes invisible because the preconceptions dominate and impose on the data analysis; the investigator habitually looks at the data through a theoretical lens and makes inferences along the pre-existing theoretical path.

4.3.3 Experimenting a deductive analysis approach
In the pilot study, prior to formal fieldwork, the researcher experimented with the deductive citation mapping approach and the proposed guideline presented in

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3 In the work of Gable, Sedera et al. (2008), the authors developed an a priori IS-Impact model through a
The pilot coding exercise commenced with a concrete mapping framework, which is the IS-Impact model consisting of 4 dimensions and 37 measures. 141 citations about the current enterprise system and observed impacts of the systems were gathered from a group of representative and active users in the participating organization (PETRO). The 141 citations demonstrate good variation by addressing a wide range of issues of the enterprise systems. In line with two mapping guidelines adapted from (Sedera 2005), mutual exclusivity and instantiation, these 141 citations were arranged into the pre-existing theoretical model by matching keywords extracted from each citation and measure. The citation mapping resulted in 9 out of the 37 (25%) measures not being populated with the sample of data, and 24 out of 141 (17%) citations not mapped into any existing measures and dimensions in the a priori framework.

Although the results of the pilot qualitative data analysis were restrained by the limited data set and sample size of respondents, it still helped the researcher to be aware of the possible weaknesses of the deductive data analysis approach.

Firstly, this top-down mapping approach can impose a priori theory on data. In other words, the analysis forces the data, phenomenon and context into the a priori theory rather than allowing the theory to make its own way from the data, phenomenon and context. The guideline of ‘mutual exclusivity of measure’ (Sedera 2005) restrain the data analysis, since it requires the coder to choose a singular interpretation of the narrative of data when multiple interpretations occur simultaneously, and map the data to the most relevant measure. However, texts are subjective and texts always have multiple meanings that could be ‘found’, ‘identified’ and ‘described’ (Krippendorff 2004). When the analysis was framed by a particular framework and ignored multiple facets reflected by raw data in order to conform to the framework, this analysis also diminished the value of field data and reduced the analytical power of data analysis. Although a qualitative analysis needs inferential rules, schemes and frameworks to take data towards the study objective, it does not equate with forcing the data into the framework.
Secondly, both mapped and unmapped data demonstrated many context specific issues that the a priori model did not accommodate. As the study had particular interest in context-specific measures and dimensions for evaluating ES in China, and was also concerned with the perspectives of local users in the Chinese context, the a priori model was not satisfactory for this purpose.

Being aware of the constraints of the deductive citation mapping approach, the researcher attempted to employ a grounded and inductive approach to qualitative data analysis; an approach that relates closely to the data and research context; one that could help the researcher to open her mind and to bring in true insights; and one that was able to exhaust the analytical potential of the rich textual data gathered in this study.

4.3.4 Employing a general inductive inquiry approach in this study

Thomas (2006) introduced a general inductive approach for analysing qualitative evaluation data, to ‘describe key features evident in the general inductive approach and outline a set of procedures that can be used for the analysis of qualitative data (p.238)’. The author was content that this general inductive analysis approach is ‘most similar to Grounded Theory (p.240)’, but does not conform strictly to the coding procedure of Grounded Theory. Nevertheless, it also deviates from Grounded Theory in that ‘researchers using this general inductive approach typically limit their theory building to the presentation and description of the most important categories (p.241)’. However, what really differentiates the general inductive approach from Grounded Theory methodology is that, although the analysis works in a bottom-up fashion, ‘the specific research objectives and evaluation questions will undoubtedly constrain the range of possible interpretations and outcomes from the inductive analysis by focusing attention on specific aspects of the data (p.240)’. Table 4.1, adapted from Thomas (2006), illustrates the difference between the general inductive approach and the Grounded Theory approach.
According to Thomas (2006), this proposed general inductive analysis approach highlights the feature of ‘general inductivity’. Here, the specific evaluation purpose will also influence the inductive inquiry. Thomas argues that:

Data analysis is guided by the evaluation objectives, which identify domains and topics to be investigated…Although the findings are influenced by the evaluation objectives or questions outlined by the researcher, the findings arise directly from the analysis of the raw data, not from a priori expectations or models. The evaluation objectives provide a focus or domain of relevance for conducting the analysis, not a set of expectations about specific findings…the approach is unlike deductive investigations in which a specific hypothesis, theory, or model is being tested (p. 239).

This study is an ES evaluation study, based on qualitative data gathered in open-ended evaluation questions, and aims to ground a context-specific ES evaluation model, assisting in assessment of a particular type of ES in a Chinese context. Specifically, the study began by evaluating the ES package from two aspects, namely (1) the quality of the artifact – the ES package, and (2) the impacts anticipated and realized from the ES package. These two evaluation aspects have been coined as the main research questions informing data collection, data making, data analysis and inference development. In line with Thomas (2006)’s general inductive approach, the evaluation objectives and perspectives provide a focus and

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<th>Grounded Theory</th>
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<td>Analytic strategic and</td>
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<td>To generate or discover theory using open and axial coding and</td>
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<td>Outcome of analysis</td>
<td>Themes or categories most relevant to research objectives identified</td>
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<td>Presentation of findings</td>
<td>Description of most important themes</td>
<td>Description of theory that includes core themes</td>
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Table 4.1 The difference between the general inductive approach and Grounded theory (Thomas 2006)
The coding practice and coding scheme developed according to this general procedure will be described in the next chapter.
4.4 Selecting the qualitative data analysis method

Although the general inductive approach proposed by Thomas (2006) is useful and instructive to this study, neither the specific analysis method nor a ready-to-be-followed procedure is provided by Thomas. The researcher decided to resort to classical and mature qualitative methods and traditions, in order to find texts informing a scientific analysis practice. In the very early stage of data analysis, the researcher was perplexed by the variety of coding instructions and different views of qualitative data analysis. Qualitative analysis is a process of data reduction, data display and conclusion drawing and verification (Miles and Huberman 1994); a specialized way of transforming data (Wolcott 1994), a course from resolving data into its constituent components, to reassembling data into analytic categories, themes and patterns (Coffey and Atkinson 1996), and a process going from de-contextualization to re-contextualization (Tesch 1990). There is no single way of approaching qualitative analysis according to (Tesch 1990), with no less than 26 analytic strategies being identified, all of which can be applied to qualitative analysis.

A review of literature on qualitative research methods suggests that Grounded Theory Methodology (GTM) is always referenced when authors discuss an inductive qualitative analysis strategy/methods/coding scheme (Tesch 1990; Miles and Huberman 1994; Wolcott 1994; Coffey and Atkinson 1996; Myers 1997; Myers 2008). As its name implies, GTM moves from data to the development of theory; it is an inductive process assisting the researcher to make ‘discoveries’ about the phenomena under study and to pursue these discoveries to construct an analysis (Charmaz 2006). This method also give the researcher theoretical openings that avoid importing and imposing packaged images and automatic answers (Strauss and Corbin 1998). The focus of GTM is on how and why people give meanings to particular experiences/situations (Glaser and Strauss 1967). In this study, GTM provides a scientific guideline for the generation of a theoretical understanding that is grounded in the experience of Chinese users of ES in Chinese organizations, with regard to the impact of ES.
The literature also suggests qualitative content analysis as an important method, consisting of a bundle of techniques for systematic text analysis (Mayring 2000). Lincoln and Guba (1985) argue that inductive data analysis bears remarkable similarities to content analysis, which is aimed at uncovering embedded information in order to make it explicit. Qualitative content analysis is defined as an approach of ‘empirical methodological controlled analysis of texts within their context of communication’ (Mayring 2000). What distinguishes content analysis from other qualitative analysis methods is the strength of using replicable and reproducible procedures for making specific inferences from text to other states or properties of its source (Krippendorff 2004). The study is fully appreciative of the structural and reliable analysis procedures of textual data provided by content analysis, such as unitizing data and quantifying data and techniques to ensure trustworthiness of analysis results. Therefore, it is believed that in this study reference to qualitative content analysis would strengthen the reliability of the qualitative analysis.

This study combines multiple qualitative analysis methods to perform an inductive, open-ended and structural analysis of textual data. Several IS academics have called for variety in approaches to the study of IS (Kaplan and Duchon 1988; Gable 1994), as the combination and triangulation of methods will enrich a study and assist in attaining valid findings. However, previous studies reported the strengths as well as the difficulties that would occur when methods from different paradigms and disciplines were combined (Kaplan and Duchon 1988). Although conflicting methods carrying varying values, assumptions, and vocabularies may interfere with the project, it was concluded that the advantages of the combination of content analysis and GTM outweighed the difficulties. The sub-sections below discuss respective analysis methods and the methods combinations.

4.4.1 Grounded theory method

Over the past decade, we have seen a substantial increase in qualitative research in the IS discipline (Myers 1997; Myers 2008), and also an increase in the use of GTM (Orlikowski 1993; Trauth and Jessup 2000; Urquhart 2001; Levina and Emmanuelle 2008) in this area. Grounded Theory comes with its own philosophical baggage, and researchers who experimented with the method encountered several
issues ranging from practice to philosophy (Urquhart 2001; Urquhart 2003). One of the issues is the extent to which a study employs GTM; whether it is being used primarily as a technique for analyzing qualitative data, or as a research philosophy in its own right.

In this study, the researcher adopts GTM as a technique to analyze qualitative evidence, because GTM provides an interesting, meaningful and useful way to conduct qualitative analysis and offers relatively well ‘signposted procedures’ for coding. However, GT theorists have advised against taking GTM as a fixed data analysis manual (cookbook); each researcher has to find his/her way with regard to their particular analysis in light of their particular research questions and goals (Urquhart 2001).

The aim of the study is to investigate the phenomenon of ‘the impact of Enterprise Systems on Chinese users and organizations’, to conceptualize the phenomenon, and then to discover categories to build a measurement model of the phenomenon. Rather than adopting the method in its entirety, the researcher uses some of the ‘signposted procedures’ of GTM and its analytic tools, such as asking theoretical questions, making constant comparisons, writing memos, conceptualizing and abstracting, in order to open up the qualitative data, acquiring genuine understanding of the studied phenomenon.

Specifically, the researcher primarily followed Charmaz (2006)’s procedure of data coding in GTM, as this author’s approach is straightforward and clearly instructive for a novice with GTM. Works of one of the co-founders of GTM, Strauss and Corbin, have been extensively referenced as well. Those seminal works provide a clear explication of GT analytic methodologies and assist the researcher in getting the best of what the GT approach can offer to this study. There is a reason why Strauss and Corbin’s approach is preferable to that of Glaser for this study. Strauss and Corbin do not dismiss researchers’ previous experience and theoretical underpinnings, and confirm that those could be a legitimate source for investigating a research problem or interests. It is important to acknowledge that prior research on IS-Impact/ IS Success (DeLone and McLean 1992; Shang and Seddon 2000; Sedera 2005; Gable, Sedera et al. 2008) has a strong theoretical bearing on this
study in many aspects. For instance, research questions in the identification survey instrument mirror the IS-Impact model, each question pertaining to each half of the model implicitly. From Glaser’s perceptive, it is probably a design that forces data from the very beginning, whereas Strauss’s offers the researcher flexibility and confidence to apply GTM, to incorporate extant theoretical base/literature in an inductive qualitative analysis, and to establish important descriptive knowledge in the end.

4.4.2 The qualitative content analysis method
Grounded theory benefits the analysis with a variety of qualitative data analysis techniques to open up the text and carefully examine its latent and literal narrative. It should be clear from this account that, as is common in research including inductive inquiry of text, the process is messy. Impressions, interpretations, propositions and hypotheses were developed over the course of the study. Codes were evolved and revised from time to time during the course of the repeated reading and scrutinizing of textual data. This experiment with GTM is difficult to manage and is a process that hardly fits the positivist idea of objective collection of neutral or purely descriptive ‘facts’ (Kaplan and Duchon 1988).

Krippendorff (2004) stated that ‘Content analysis is an empirically grounded method (p.xvii)’, defining it as ‘a research technique for making replicable and valid inferences from text to the contexts of their use (p.18)’, and continuing, ‘Content analysis is an unobtrusive technique that allows researchers to analyze relatively unstructured data in view of meanings, symbolic qualities, and expressive contents they have (p.18)’ (Krippendorff 2004).

According to (Tesch 1990), content analysis is conducive in studying ‘the characteristics of language’. Compared to other types of qualitative methods, content analysis is ‘mostly paying attention to language, dealing with discrete parts of language, such as words or phrases, and the research process consists of very orderly procedures (p.59)’ (Tesch 1990). The essential idea in content analysis is that the many words of the text are classified into fewer content categories. The basic procedure in content analysis is to design categories that are relevant to the research purpose and to sort all occurrences of segments of data (recording units)
into these categories. Then from the frequency of occurrences in each category certain conclusions could be drawn in response to the research questions (Tesch 1990).

In fact, some of the procedures of content analysis may well be quantitative, and this quantitative attribute may give content analysis the image of being an over simplified frequency counting (Steenkamp 2007). However, regarding the specific research objective and the intended results of the analysis of the content, this study takes the quantification attribute as a useful tool in the analysis. This analysis aims to identify analytical categories which can be transformed into assessment indicators measuring the effect of an ES within the context of Chinese ES usage and adoption. Content analysis is used to quantify the data by counting the frequency of occurrence of data segments pertaining to emergent categories. The frequency with which a category occurs in a message stream is taken to indicate the awareness that qualitative term in the message (Krippendorff 2004).

The literature suggests that these are not the only forms and definitions of content analysis available. Having evolved over a couple of decades, qualitative content analysis has deviates from its early approaches, moving from ‘research techniques for the objective, systematic and quantitative description of the manifest content of communication’(Berelson, 1952, cited in Krippendorff (2004), p.19) to ‘making replicable and valid inferences from texts to the contexts of their usage (p.18)’ (Krippendorff 2004). The researcher selects and discusses the most relevant form and definition which is considered will serve the study purpose best. The most up-to-date and comprehensive guidance on content analysis methodology was that of (Krippendorff 2004). This seminal content analysis textbook is insightful for establishing the shared views and approaches of other content analysis literature, and is useful for comprehending differences in some methodological issues of other content analysis references (Steenkamp 2007). Therefore, this study primarily relies on Krippendorff’s (2004) approach and follows this author’s instruction when applying content analysis.
4.5 Selecting the data analysis technique and procedures

Qualitative analysis is very flexible and there is no simple, ‘right’ way of doing it. Researchers must judge which variations are most appropriate for their particular problems, and this makes the analysis process most challenging and interesting. An enormous amount of work is required during the process (Tesch 1990; Miles and Huberman 1994; Elo and Kyngas 2008).

This inductive analysis approach is not so different from Tesch’s (1990) strategy of de-contextualization and re-contextualization. De-contextualizing data involves segmenting portions of data and slicing up the data set. Tesch defines segmenting as dividing data into portions that are comprehensible by themselves and large enough to be meaningful. De-contextualization means separating data enough from their original context while retaining meaning. Meanwhile, re-contextualization involves organization and sorting of the segmented data. She describes re-contextualization, ‘the segment is settled in the context of its topic, in the neighbourhood of all other segments of the data corpus that deal with the same topic (p.122)’. The re-contextualization arranges the segments of data into an ‘organizing system’ consisting of a set of analytical categories.

Hence, a concurrent flow of activities constitutes the qualitative analysis, involving unitizing data into ‘recording/coding unit’, coding manifest and latent meanings of the segment of data (recording/coding unit), sorting homogeneous segments of data into emergent categories, then rearranging these categories into an organizing system in which the original data is not naturally arranged in a way amenable to analysis. Further, the analysis entails a variety of techniques related to Grounded Theory and content analysis, jointly facilitating a systematic, comprehensive but not rigid analysis process. As Tesch (1990) asserts, qualitative analysis should proceed in an orderly fashion and requires discipline, an organized mind and perseverance.

4.5.1 Unitizing data

Unitizing is an essential sub-process in content analysis. Unitizing is a process of coding whereby ‘raw data are systematically transformed and aggregated into units
which permit precise description of relevant content characteristics’ (Lincoln and Guba 1985). Unitizing is also referred to as the unit of analysis, which is one of the smallest, yet one of the most important elements in content analysis (Steenkamp 2007). Krippendorff (2004) also suggests that ‘unitizing involves defining information bearing units, separating them along their boundaries, and identifying them for subsequent analysis.’ In this study’s qualitative analysis, unitizing data is the first step in the course of analysis. The researcher divided respondents’ paragraphs into singular units. Each unit is best understood as a single piece of information that stands by itself; and each unit is meaningful and interpretable in the context of the research. Other content analysis theorists argue that ‘unitizing assists in uniformity, as unitizing allows the most diverse literary texts to be processed in the same way, meanwhile, unitizing allows any form of communication to be broken down into uniformly computable pieces’ (Carney 1972).

Krippendorff (2004) suggests that three kinds of units deserve distinction: (1) Sampling units are units that are distinguished for selective inclusion in an analysis; (2) Coding units collectively bear the information that content analysis processes, and provide the basis for statistical accounts (Steenkamp 2007). (3) Context units are units of textual matter that set limits on the information to be considered in the description of record units. This unit delineates the scope of information that coders need to consult in charactering the coding units (Steenkamp 2007).

The identification of coding units is a critical step in the analysis, since the coding unit is the basic element to be coded. The coding unit can be identified in the form of a single word, a symbol, a phrase, a sentence, or paragraphs and themes, and the choice of unit should be dictated by the purpose of analysis. The researcher considered using theme as the coding unit. Theme is a single assertion about some subject. The term ‘theme’ is taken to mean a semantically equivalent cluster of words with different meanings or connotations that, taken together, refer to some theme or issue (Steenkamp 2007).

In this study, the researcher defined the coding unit as ‘citation’, which is a singular statement carrying a distinguished ‘theme’. The theme can pertain to any
meaningful aspect of IS and its impacts, such as features of the IS, performance of IS and the benefit of IS. Meanwhile, the coding unit, citations, is the smallest specific segment of content that can be subsequently placed in a given or emergent category. What is important in the unitizing is the ‘singularity’ of each citation. ‘Singularity’ has twofold meanings. On the one hand, a citation is singular as it is a unique bit of data pertaining to a single identity of a person, or object, or a history of a unique event in a sequence of events (Dey 1993). On the other hand, the citation has singularity because it stands out as worthy of attention, representing some rare or interesting issue (Dey 1993). Tesch (1990) provides an excellent definition of the basic analysis unit as ‘a segment of text that is comprehensible by itself and contains one idea, episode, or piece of information (p.116)’.

According to the description of a ‘theme’, the physical form of a citation is flexible. In this sense, the citation can be a phrase, a segmented sentence, a whole sentence, or a cluster of sentences, but only if the aggregated text semantically conveys a ‘singular’ issue related to IS, such as the reliability of the IS or the enhanced response speed of the IS. Nevertheless, it is also recognized that unitizing data according to theme is difficult and time consuming, as the theme boundaries are not as easily identified as those of words, paragraphs, or sentence (Krippendorff 2004).

The context unit is also important in this analysis, because context units are essential in classifying a coding unit (Krippendorff 2004). Inference could not be made only on the basis of a specific word appearing in the communications. The appearance of the word should be analyzed in the context unit (Steenkamp 2007). Carney (1972) suggests that the content unit defines the coding unit’s meaning. The meaning of a word typically depends on its syntactical role within a sentence. To identify which meanings apply to a word from a list of multiple meanings, one must examine the sentence in which the word occurs (Krippendorff 2004). Similar to a single word, when we take ‘theme’ as the smallest unit of analysis, we have to examine a large scope of text where the theme occurred. Generally, the larger context units yield more specific and semantically more adequate accounts of the coding unit. It outlines a scope of information, background and textual context that analysts need to consult to establish the precise meaning of the coding unit. This
study considered a respondent’s response paragraphs as a context unit from which
the citation is decomposed. To characterize the themes of IS evaluation, the
symbolic materials presented in each paragraph were examined. The identification
of the coding unit in the study will be described in Chapter 5.

4.5.2 Coding for meaning (Microanalysis of data)
Qualitative analysis aims to code the semantic meaning of the data. The analyst
interprets the meanings of the text to reply to the research questions within a
particular research context. This section will illustrate what the analysis aims to
code and the extent to which the coding will interact with the data.

Krippendorff (2004) asserts that ‘content analysis is a method for inquiring into
social reality that consists of inferring features of a nonmanifest context from
features of a manifest text’. Early content analysis research was to describe
manifest content. This type of qualitative analysis was limited to the manifest
characteristics or signs of text, such as the occurrence of particular words, or the
number of words related to particular themes (Steenkamp 2007). Restricting
analysis to manifest content and over-reliance on quantification of the manifest
content is something this study attempts to avoid. Carney (1972) comments that
restricting analysis to manifest content is a ‘straightforward, non-interpretive,
compounding, semi-clerical recording (coding) operation’, and would be of very
limited value. In this case, in spite of the manifest characteristics of a text, the
focus of the analysis is to interpret the meanings of messages in ways that go
beyond the manifest content.

Text is complicated enough to analyse. Krippendorff (2004) identifies a number of
characteristics in terms of text. He warned content analysts that texts have no
objective and no reader-independent quality; text can be read from numerous
perspectives by varying coders. However, reviewing the content analysis literature,
the researcher failed to locate an appropriate analytic technique in content analysis
which would equip the researcher to open the text, to go beyond the denotative
elements in a text, and to infer valid underlying meanings of interest to the
investigation. Several content analysts (Carney 1972; Krippendorff 2004;
Steenkamp 2007) suggests ‘reading between the lines’, implying meanings are
'derived from the setting in which the message was expressed, and the symbols and connotations embedded in the message’. However, ‘reading through the lines’ is such a crude and general instrument; it is not instructive enough for a novice qualitative researcher.

Grounded Theory, another tradition of qualitative method, provides systematic and reliable analytic techniques in terms of dealing with subtle and intricate meanings hidden in textual data. Open coding and asking analytic questions are primary techniques the analyst employed in the analysis.

Open coding involves naming segments of data with ‘codes’, short terms or descriptions, which simultaneously summarize and account for each piece of data. As for this study, the segment of data required to be open-coded is the smallest unit of analysis unitized in the previous step. Open coding is characterized by openness and microanalysis (Strauss and Corbin 1998), which requires the analyst to remain open to exploring whatever analytic possibilities can be discerned in the data and creating codes that best fit the data. The openness of initial coding will spark thinking and allow new ideas to emerge. The earlier Grounded theorists suggested analysts keep the initial coding open-ended without having preconceived concepts in mind (Glaser and Strauss 1969). Microanalysis is an enormously useful tool in initial open-coding, helping the analyst to open up text and also to avoid making conceptual leaps (Charmaz 2006). It is through careful scrutiny of data, line by line, that researchers are able to uncover new concepts, novel relationships and latent meanings conveyed by the text.

Qualitative study also gains analytic power from asking effective questions. In qualitative analysis, questions direct the researchers’ understanding of the theoretical issues in advance and facilitate productive inquiries (Strauss and Corbin 1998; Charmaz 2006). Good questions will stimulate intensive investigation and then generate ideas or ways of looking at the data. Good questions also lead the researcher to answers that serve the developing theoretical formulation. Strauss and Corbin (1998) suggests four types of questions assisting the researcher in productive data analysis: sensitizing questions, theoretical questions, practical questions and guiding questions. Specific to this study, the first two types of
inquiries have been made constantly throughout this inductive data analysis. Sensitizing questions tune the researcher to what the data might be indicating. Those questions allow the researcher to microanalyze the IS-Impact statements given by informants and to generate initial categories (initial codes) to each statement. Later, theoretical questions help the researcher to see variation and similarity between IS-Impact statements, leading to the emergence of abstract categories (focus codes) and the connection of relevant concepts.

4.5.3 Coding for data reduction

This section delineates the major operation and function of data analysis in this study. There are a variety of perspectives of data coding: for example, coding can either work as a function of data simplification and reduction, or coding can be conceptualized as data complication and expansion (Coffey and Atkinson 1996). Given the objective of the analysis, the researcher applied a data reduction strategy in the coding. Miles and Huberman (1994) conceptualized qualitative analysis as three concurrent flows of activity, consisting of data reduction, data display, and conclusion drawing and verification. ‘Data reduction’ refers to the process of selecting, focusing, simplifying, abstracting, and transforming the data that appear in written-up field notes or transcriptions.

Data reduction is not a superficial and simple treatment of qualitative data, as some qualitative theorists suggest; rather, it is a process of ‘data condensation’ (Tesch 1990) which requires constant analytical decisions throughout the analysis - the decision that sharpens, sorts, focuses, discards, and organizes data in such a way that ‘final’ conclusions can be drawn and verified (Miles and Huberman 1994). Thomas (2006) actually applies a process of data reduction in his proposed general inductive analysis, asserting that ‘the intended outcome of the process is to create a small number of summary categories (e.g., between three and eight categories) that in the evaluator’s view capture the key aspects of the themes identified in the raw data and are assessed to be the most important themes given the evaluation objective (p.242)’. The important activities in the proposed inductive coding process are to reduce overlap and redundancy among a large number of early codes.
(30-40 categories) into a few concrete codes (15-20 categories), and then to create a model incorporating most important codes (3-8 categories).

Coffey and Atkinson (1996) concluded that, in the perspective of data simplification and reduction, data are reduced to their bare bones, stripped down to a simple general form. Coding in this context is concerned with the identification of analytically conceptual schema to reduce the data corpus to manageable proportions. In other words, this coding is a process of indexing data text according to the conceptual schema, and facilitates the retrieval of data segments categorized under the same codes.

Coffey and Atkinson (1996) also refer to Seidel and Kelle’s (1995) three operations of coding as steps of data reduction: (1) noticing relevant phenomena, (2) collecting examples of those phenomena, and (3) analyzing those phenomena in order to find commonalities, differences, patterns, and structures.

This research aims to reduce a large number of citations into analytical categories. The analysis involves the above operations in terms of reducing the data text, consisting of identifying relevant IS-Impact categories from citations, collecting and grouping examples of citations pertaining to IS-Impact categories, then analyzing the IS-Impact categories for commonalities, similarities and difference, and afterwards formulating these IS-Impact categories into a IS-Impact model. In this sense, the large chunk of textual data is ‘reduced to its bare bones’ and ‘stripped into a general form’ of an analytically conceptual framework.

The research utilized mature coding techniques, specifically pattern coding (Miles and Huberman 1994) and focused coding (Charmaz 2006), to perform the data reduction. The coding exercise, examples and descriptions are presented in Chapter 5.

4.5.4 Coding for categorizing

According to the preceding section, the purpose of data reduction is to develop analytical categories which will be consolidated into the IS evaluation model for assessing the impact of IS in the Chinese context. Hence, categories, namely concepts pertaining to the features of IS and the effect of IS, are the results yielded in the coding activity. In most cases, ‘codes’ are simply abbreviations of the labels
for the categories in many qualitative textbooks and studies. Codes and categories are interchangeable in this thesis.

Creating categories is both an empirical and a conceptual challenge, as categories must be conceptually and empirically grounded (Dey 1993). Successful content analysis requires that the researcher can analyse and simplify the data and form categories that reflect the subject of study in a reliable manner (Kyngas & Vanhanen 1999). Credibility of the research findings also deals with how well the categories cover the data (Elo and Kyngas 2008).

Categorizing is a widely used method in qualitative data analysis. (Maxwell and Miller (2008) indicate that qualitative analysis is always applied to analyze a ‘similarity-based relationship’ between things conveyed in linguistic material. These authors argue that ‘similarity-based relations involve resemblances or common feature; their identification is based on comparison…in qualitative data analysis, similarities and differences are generally used to define categories and to group and compare data by category (p.462)’ (Maxwell and Miller 2008). Similar to content analysis theorists, Maxwell and Miller assert the importance of ‘unitizing’. They suggested that ‘segmenting the data is obviously involved in categorizing analyses’, as the segmented data pave the way for subsequent analytic procedures where the researcher identifies the categories by comparing the similarity and difference of each unit of segmented data.

Categorizing is not far away from Tesch’s (1990) perspective of re-contextualization, where ‘a (data) segment is settled in the context of its topic, in the neighbourhood of all other segments of the data corpus that deal with the same topic (p.122)’. The re-contextualization is the assembling of relevant coding units; in physical form, the coding units belonging in one category are assembled together.

However, categorizing is not a mechanism of sorting coding units and packing similar ones together. In theory-building research, categories are not only intellectual tools for organizing data segments, but are eventual research results (Tesch 1990). Tesch (1990) and Coffey and Atkinson (1996) suggest codes (categories) are ‘heuristic devices’. The analyst is attaching codes as a way of
identifying and reordering data, allowing the data to be thought about in new and different ways.

In this coding, the coding units, namely citations, are labelled and grouped by categories; they are then examined and compared, both within and beyond categories. This data categorizing creates ‘a similarity-based ordering of data that replaces the original contiguity-based ordering’ of data (Maxwell and Miller 2008) after the coding process. The researcher also tries to refine the categories and to sharpen their boundaries, since her interest is in developing ‘concepts’. The complete and mutually exclusive concepts of IS-Impact in the Chinese context are the ultimate goals in the analysis. In this sense, the categories are not viewed as containers for data pieces that are about the same topic; rather, they are seen as potential constructs. The establishment of concrete categories is, in itself, a scholarly achievement. In this study, the first-order categories are conceptualized as ‘IS-Impact measures’ and the second-order categories are conceptualized as ‘IS-Impact dimensions’. They are presented in Chapter 6. The process of data categorizing is presented in Chapter 5.

4.5.5 Criteria for categories

Section 4.4 states that the analysis results are categories. One of the critical aspects of the coding process is classifying the citations into content categories. Moreover, what distinguishes the analysis performed in this study is that, rather than relying on any extant conceptual model, the general induction procedure formulates codes, categories, and concepts from the raw data. However, there are no rules for forming categories (Carney 1972). Researchers must exercise subjective choice in the precise makeup and definition of relevant categories (Steenkamp 2007). This subsection discusses the requirements with relation to inductive categories. The established criteria will aid in the validity of the analysis results.

Krippendorff (2004) suggests two requirements that categories contained in coding scheme must acquire: the categories must be characterized as ‘mutually exclusive’ and ‘exhaustive’ (p.132). These two criteria ensure that the resulting records represent texts completely and unambiguously (Krippendorff 2004). Regarding ‘mutual exclusivity’, no recording unit may fall between two categories
(Steenkamp 2007). All categories have to be related to one uniform system of classification and categories have to be such that an item can be classified under only one of them, not under several (Carney 1972). Regarding the requirement of ‘exhaustiveness’, Steenkamp (2007) refers to the ‘all-embracing manner’ in terms of the category of the phenomena researched. He argues that categories pertaining to the studied phenomena should be exhaustive of the analytical theme, in accordance with the analytic framework adopted.

The literature on IS evaluation studies suggest two criteria in term of verifying appropriate measures by using qualitative data: ‘instantiation of measures’ and ‘mutual exclusivity of measures (Sedera 2005). The criterion of instantiation partially decides on retaining or dropping a measure; moreover, ‘the number of citations mapped into a measure determined its goodness (p.93)’ (Sedera 2005). As with content analysis text, the ‘mutual exclusivity’ proposed by (Sedera 2005) is explicated as a critical requirement of the measures. The author states that:

A measure was considered overlapping, if a citation was mapped into more than one measure. In such situations the most-suitable single measure of success was selected to include into the a-priori model. In a situation where the intended measures do not occur individually, but always transpire simultaneously; those measures were combined into a compound measure (p. 93)

This analysis purports to develop an evaluation framework to aid in the assessment of IS as well as the impact of IS in Chinese organizations. The resultant evaluation framework is an ‘organizing system’ (Tesch 1990) of categories representing the phenomena of IS-Impact in China. Meanwhile, this ‘organizing system of categories’ is akin to the perspective of ‘analytic theory’ (Gregor 2006), where this type of theory aims to analyse ‘ “what is” as opposed to explaining causality or attempting predictive generalizations … they describe or classify specific dimensions or characteristics of individuals, groups, situations or events by summarizing the commonalities found in discrete observation (p.612)’. Gable, Sedera et al. (2008) further argue that the phenomena of IS-Impact, ‘akin to the analytic theory, should be conceptualized as formative dimensions of the
multidimensional construct (p.390); further, the construct conceptualization should conform to a set of criteria: mutual exclusivity, completeness and appropriate hierarchy.

Considering the requirements of both the categories of development in qualitative analysis and model conceptualization in the IS evaluation area, the researcher proposed three requirements for the categories identified in the analysis. These requirements are discussed below.

**Completeness of the categories:** Exhaustiveness is almost impossible to achieve, as there is no set of categories that will cover all circumstances of a phenomenon. Data and human ability are always constrained or limited in comprehending all cases when confronting an open-ended and broad research problem. Therefore, instead of exhaustiveness, an acceptable degree of completeness of categories is more feasible for a categorization-oriented analysis. Additionally, model completeness is essential in formative concept conceptualization (Gable, Sedera et al. 2008). Hence, in order to fully account for the phenomenon of IS-Impact in Chinese organizations, completeness of the categories is an essentially important requirement.

**Mutual exclusivity of categories:** Mutual exclusivity is concerned with the goodness of the organizing system of categories. It requires that each category is distinguished from other categories. The classification of categories should have clear boundaries defining their content domain. Specific to the coding exercise, one single coding unit only can be tapped into one category, and no multi-linkage is allowed.

**Appropriate hierarchy of categories:** IS-Impact and IS success have been suggested as a complex, higher-order phenomenon. The qualitative analysis is akin to a qualitative factor analysis in terms of identifying how clusters of lower-level concepts load to a more general concept (Lee, Mitchell et al. 1999). For displaying and interpreting this phenomenon in the form of categories, it is necessary to employ an appropriate hierarchical presentation illustrating the relationship of first-order categories and second order categories (sub-categories).
**Instantiation of categories:** This criterion is complementary to the above three requirements. The number of coding units pertaining to a category indicates the extent to which the respondent in the research context is aware of the particular concept related to IS-Impact. Therefore, instantiation of categories can be regarded as supportive evidence of the significance of a category. However, counting and quantity in qualitative research is always controversial. For example, content analysis regards counting as an important tactic for representing the content of text data, but more interpretive-oriented methods would not favor quantity. The section below will discuss and justify the application of counting in this analysis specifically.

**4.5.6 Quantity and counting**

As stated in previous sections, qualitative analysis mainly places emphasis on the meaning and interpretation of data through the processes of description, coding and categorization. We also recognize the existence of alternative techniques complementing the qualitative treatment of textual data. According to (Miles and Huberman 1994), counting is one of 12 tactics for demonstrating what it is in the data and how meaningful they are. In content analysis, counting is a critical data recording/coding technique. Steenkamp (2007) suggests that counting or quantification is important in content analysis, as it aids in the quest for accurate re-representation, by allowing researchers to summarize results and to report them succinctly. Furthermore, it gives researchers additional analytical tools that can aid in interpretation and analysis.

According to the content analysis literature, there are two distinctive forms of counting, (1) determining either the presence of something or the frequency of the appearance of something (Steenkamp 2007); (2) described as a level of measurement, such as, using a ‘yardstick’ to compare ‘something’ with (Carney 1972).

Specifically, the literature also suggests two forms of frequencies in content analysis. One form is an index of the presence or absence of a reference, concept or phenomenon (Krippendorff 2004), which denotes whether a particular coding unit appears (Steenkamp 2007). The other form is an index of frequency, taken to
indicate the magnitudes of an existing phenomenon. The frequency also denotes how many times a coding unit appears, as ‘every occurrence of a given attribute is tallied’ (Steenkamp 2007).

This study is not concerned with presenting quantities that result from measuring. The form of counting undertaken in this study is a quantitative assessment, expressed as frequencies. The counting is relevant, with indices of both presence and frequency. Particularly, the quantity reported in the analysis is the ‘frequencies of mention’, which are ways to count the number of mentions of a particular theme of the ‘IS-Impact in Chinese context’. When discussing this study’s results, the term ‘frequencies’ or ‘counts’ refer to the quantities that resulted from counting every occurrence of citations pertaining to a single category.

Coffey and Atkinson (1996) remind analysts that coding qualitative data differs from quantitative analysis; we are not merely counting, but are placing the qualitative interpretation of data at the heart, with the counting being a supportive tactic. Given the specific purpose of qualitative analysis in this study, the researcher asserts that it is appropriate to utilize the technique of counting in the analysis. The frequencies of themes and categories demonstrate the overall trends, to get some new leads, and to see some unexpected differences. The counting also allows the analyst to see the general drift of the data more easily and rapidly by looking at the distribution (Miles and Huberman 1994). As all this assists in the interpretation of qualitative data, the weakness in terms of qualitative analytic inquiry can be tolerated in this analysis.

4.5.7 The coding scheme: explicit written instructions for coding

Content analysis advocates using mechanical instructions that contain explicit and detailed rules so that coders can apply a reliable coding process. Coding instructions intend to explicate rules that minimize the use of subjective judgments in the coding process. Carney (1972) argues that if the content analyst is explicit about the procedures of content analysis, then the reader can check on how the facts were obtained and on the care with which analysis was conducted. Krippendorff (2004) claims that researchers should explain clearly what they have done, to convince others that their research was sound and that their results should
be accepted. Steenkamp (2007) also suggests that written instruction should be sufficiently comprehensive and as replicable as possible, so that others could use them as their sole guide to obtain the same answer as that obtained from the initial researcher.

It would be impossible to convey all that is involved in reading, observing, comprehending and inferring in a written instruction or a coding scheme, but the researcher attempts to present a detailed descriptive account of the analysis to serve fellow researchers, supervisors and critics. This study’s descriptive account of methodological issues is presented in this chapter. The account of application of the research methodology, referred to as ‘identification design’, is presented in Chapter 5. The research design described in Chapter 5 includes all feasible information the researcher can communicate in writing, so that this research design is as replicable as possible and so that others can use them to verify the study’s results. This descriptive account of how the methodology is applied includes the issues of identification survey design, sampling, coding scheme, coding techniques, data unitizing, open-coding data, pattern-coding data, focused-coding data, and condensing data to a manageable representation - analytical categories and counts of citations.

4.6 Requirements of reliability

Reliability is synonymous with dependability, stability, consistency, predictability, accuracy. Reliability is usually tested by replication, for example, the test-retest, or parallel forms correlation. Moreover, reliability is not prized for its own sake but as a precondition for validity (Lincoln and Guba 1985). Reliability is an important criterion in judging the ‘trustworthiness’ of qualitative research. Wimmer & Dominick (2003) commented that ‘a study is reliable when repeated measurement of the same material results in similar decisions or conclusions (p.156)’. Silverman (2005) defines reliability as ‘the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions (p.210)’. In this research, the researcher paid particular attention to the reliability of the inductive data analysis, reasoning and inference.
making, particularly ensuring the stability and consistency of the coding process and results. Two techniques are used to examine reliabilities: Intra-coder agreement and inter-coder reliability were employed to ensure study reliability.

4.6.1 Reliability in qualitative research
Krippendorff (2004) reports that reliability is important as it provide assurance ‘that the data are obtained independent of the measuring event, instrument or person (p.211)’. Content study expects that analysis techniques are reliable and result in findings that are replicable (Krippendorff, 2004). The literature generally describes three types of reliability: stability, reproducibility, and accuracy (Steenkamp 2007). Generic discussions of these three types of reliabilities and rationale for selecting particular types of reliability are provided here for clarity.

4.6.2 Stability and intra-code agreement
Stability is ‘measured as the extent to which a measuring or coding procedure yields the same results on repeated trials (p.215)’ (Krippendorff 1980). Stability refers to the consistency of results when re-coding the same data in the same way at different points in time (Wimmer & Dominick, 2003). To assess stability, data is created under test-retest conditions, in which the same individual rereads, re-categorizes, or re-analyses the same texts after a time interval (Krippendorff 1980; Steenkamp 2007). Then two set of results are compared and calculated to test the stability of analysis. This test-retest technique is also called an intra-coder agreement. According to Steenkamp (2007), stability will be achieved when differences between the two sets’ results are insignificant. A stringent cut-off, 90% of agreement, is always used in qualitative content analysis (Hruschka, Schwartz et al. 2004).

Krippendorff (1980) cautions qualitative researchers that, as a measure of reliability, stability is the weakest form of reliability, and is insufficient as the sole criterion for accepting data as reliable. However, given the specific data analysis objective and the analysis approach employed in the study, it is necessary to emphasize stability as a criterion of study reliability.

As described in previous sections, the employment of an inductive approach will inevitably introduce more subjectivity into the analysis than would a deductive
approach. Therefore, a structural coding procedure and a set of solid inferential rules of coding become more important in this scenario. The intra-coder agreement test demonstrates the stability of the self-coding exercise in which no decision was made ‘slippery’ or arbitrarily, following solid rules to guide the coding decisions.

In conclusion, the intra-coder agreement was performed by the initial coder herself and was set forth to test the stability of the inductive coding process, which should remain unchanged over time (Krippendorff 1980). To assess stability, data is created under test-retest conditions, in which the researcher reread, re-categorized, and re-analysed a sample of citations, in the double-coding session, which was held after some time had elapsed. Reliability statistics are then compared using the two set of results.

4.6.3 Reproducibility and inter-coder reliability
Reproducibility is the degree to which a process can be replicated by different analysts working under varying conditions, at different locations, or using different but functionally equivalent measuring instruments (Krippendorff 2004), (p.215). Compared to stability, reproducibility is considered to be a far stronger measure of reliability (Krippendorff 2004; Steenkamp 2007). Reproducibility is also known as ‘inter-coder reliability’, where ‘two or more individuals, working independent of each other, apply the same recording instructions to the same units of analysis’ (Krippendorff 2004), (p.215).

Given the inductive coding procedure applied in this study, the researcher argues that it is impossible to reproduce an inductive analysis and to ground a set of exact emergent categories by another coder. This data analysis is generally exploratory and inductive, meaning that the analysis did not rely on any predefined concrete code maps to discern the text data, but gradually developed a set of codes (potential IS-Impact measures) from the data corpus. Moreover, in a deductive analysis, a very concrete code book or map is a major instrument that equips the human coder for making data, whereas in an inductive analysis, the human coder, in this case also the primary researcher, is almost the sole ‘inquiry instrument’ (Lincoln and Guba 1985) to do the analysis. Hence, the credibility of the human coder is critical in the inductive analysis, and the analysis reliability is partially dependent on
familiarity with the particular research context, and accumulated understandings and experience with the data set. According to the researcher’s individual experience in the inductive analysis, the analysis course was accompanied by an evolving and emergent learning process in terms of research context and data. This learning is idiographic, intangible and not replicable by other individuals. Therefore, the researcher argues that the second individual might be able to replicate the tangible coding process and follow the fixed inferential rules of coding, but might not be able to reproduce the exact learning process, to make the same interpretation and to arrive at the same set of results. Given this feature of inductive coding, the inter-coder reliability purporting to reproduce overall analysis process has to be compromised here.

This study adheres to recommendations made by (Thomas 2006), who suggests some techniques of coding consistency checks for assessing the reliability of inductive-fashioned data analysis. In his account of reliability checking, Thomas (2006) describes an approach, named ‘check on the clarity of categories’, to test the consistency of inductive coding. The operation is described below:

A second coder is given the research objectives, the categories developed in the initial coding, and descriptions of each category when an initial coding was complete. The second coder is then given a sample of raw text (previously coded by the initial coder) and asked to assign sections of the text to the categories that have been developed. A check can then be made of the extent to which the second coder allocated the same text segments to the initial categories as the first coder. (Thomas 2006)(p.244)

Referring to this approach, the researcher tested the consistency or reproducibility of the coding results. In the context of the IS-Impact study, the inter-coder reliability test conditions are interpreted as enabling independent coders, working under varying conditions and at different locations, to test the consistency of the initial coding results, by mapping a sample of coded citations into the developed categories. The design and testing results are presented in Chapter 5.
4.6.4 Accuracy
Accuracy requires comparing the analysis results to a ‘known’ well answer. Accuracy is the degree to which a process conforms to its specification and yields what it is designed to yield (Krippendorff 2004). In this scenario, the researcher tests the reliability against the two ‘known’ complete IS evaluation measure pools, one being the IS-Impact model with 37 measures; another being the IS Success model synthesized by DeLone & McLean (1992).

4.7 Summary
This chapter discussed the methodology issues of the study. The chapter began with a description of the rationale for the choice of a qualitative methodology. Given the research objective and the research question, an inductive investigation approach was employed. Specific to a qualitative analysis method, the study reference to both the Grounded Theory method and the Content analysis method, because both consist of particularly useful analytical tools and approaches that would assist in systematic and comprehensive qualitative data coding. This chapter generically depicts major methodology choices and the rationale for those choices. The detailed research design with relation to the methodology is presented in Chapter 5. These discussions of generic methodology issues emphasize the importance of explicating how methodology issues have been applied in the field work and subsequent analysis. Without transparent and detailed explanations, we are not able to justify the application of the study and to convince readers of the reliability and validity of the study.
# Chapter 5  Research design: Identification survey

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<td>198</td>
</tr>
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</tr>
</tbody>
</table>
5.1 Introduction

Chapter 4 discussed the methodology issues of the study. This chapter will focus on operational issues relating to the methodology problem, namely, how the study applied the research methodology and methods in the real research scenario and applied the methodology and methods in the research design. A research design entails a list of operations issues which need lots of consideration of sampling, unitising, processing and assessing for the data analysed. Specific to this study, the design of the subjective IS evaluation study involved a systematic, objective and reliable approach to make inquiries about the study object of interest. This chapter will demonstrate the following operational issues, which together, constitute a coherent research design.

1. Delineating the rational choice of case: finding the research setting
2. Selecting an appropriate sample of respondent: finding the participants
3. Deciding the method and instrument to gather empirical data: considering gather data from a large scale qualitative survey - identification survey
4. Demonstrating the usefulness and feasibility of the instrument: devising and pilot testing the data gathering instrument
5. Selecting a method to approach the respondent and disseminate the inquiries in terms of the topic: distributing instrument and collecting the response from respondent.
6. Selecting the language to perform the analysis: coding in English or Mandarin
7. Deciding on the computer-aided coding software: choosing NVivo or spreadsheet
8. Developing rules, guideline and procedures for coding: devising a coding protocol
9. Deciding on the coding techniques: combining mature coding techniques
10. Selecting and defining a unit of analysis: utilizing data
11. Deciding on what to code: coding for meaning of relevant information
12. Deciding on what not to code: dealing with irrelevant information

13. Deciding on how to code: coding for reducing and categorizing data

14. Deciding on the output of the code: developing an organizing system of categories

15. Deciding on the assessment of coding: performing test-test and test-retest on a sample of data

16. Analysing and interpreting the coding results: finding the answers for the research questions

The next section will present an overview of the identification survey, broadly introducing the objective and purpose of the qualitative survey. The remainder of the chapter discusses how the specific issues pertaining to the study design have been tackled and applied.

### 5.2 Overview of identification survey

The identification survey is designed to inventory a salient list of ES features and the essential impacts delivered by ES. It is noted that prior research has at times employed incomplete or inappropriate measures of success or impacts to gauge the overall IS-Impact phenomenon (DeLone and McLean 2003; Gable, Sedera et al. 2008; Petter, DeLone et al. 2008); therefore, this study emphasizes the content validity of the IS-Impact framework, attempting to represent an entire coverage of all the relevant aspects of the phenomenon under investigation. The identification survey is conducted in the largest Chinese joint-venture firm in the petrochemical industry (PETRO). PETRO, having used SAP R/3 systems since their establishment in 2003, now have 10 modules fully installed, including FI, CO, PM, MM, HR, PP, SD, PS, QM and WMS.

The method of identification survey used is adapted from a previous IS-Impact study. However, a research design, though applicable in one scenario, may not generate the same good results in another. Rather than simply replicating the previous research design as conducted in the Australian context, the researcher employed a set of pilot studies to test the feasibility of the original identification
survey (I-survey) design and instrument. A well-translated and modified survey instrument has been derived from the pilot study.

The purpose of the identification survey is to investigate Chinese users’ perceptions on ES, specifically SAP, and its impacts. This investigation results in a measurement model conceptualizing the phenomena of ‘IS-Impact’ in the Chinese organizational context. A complete list of salient IS-Impact measures was identified from the identification survey and was constructed into a hierarchical measurement model. In addition to the primary purpose mentioned at the beginning of the passage, a couple of detailed objectives of the identification survey are summarized below.

The chapter mainly describes the procedure and techniques for gathering and analyzing data in the identification survey. After a brief introduction, the chapter describes the identification survey design whereby the researcher collected data. Afterwards, the qualitative data analysis methods are elaborated. Having learned a great many lessons in the pilot study, the researcher adjusted the qualitative analysis approach and decided to adopt an inductive approach in the identification survey. As described in Chapter 4, the inductive data analysis approach primarily referenced Grounded Theory methods (GTM) (Glaser and Strauss 1967; Strauss and Corbin 1998; Charmaz 2006) and qualitative Content Analysis (Carney 1972; Krippendorff 2004).

5.3 Research setting

5.3.1 Canvassing participants of the study

A package for potential participants was designed prior to approaching the Chinese industry practitioners. The purpose of the package was to introduce the study to the practitioners and to canvass industry participants who may be interested in attending the study. The researcher attempted to gain access to one or more Chinese organizations to conduct a series of field work studies, including the pilot study, the formal survey, and follow-up interviews if necessary. The package was co-produced with student colleagues in a research team, in English. Then, the
package was translated into Mandarin to fulfil the needs of this study. The package is attached in Appendix B.

5.3.2 Criteria for selecting participating organization

When single case study design is applied, the underlying rationale for the case selection is threefold: ‘critical’, ‘extreme’ or ‘revelatory’ (Yin 1994). In this specific study, the candidate intends to choose a ‘critical’ case which will assist in testing a well-formulated theory. Yin (1994) explained the rationale of using a critical case:

To confirm, challenge, or extend the theory, there may exist a single case, meeting all of the conditions for testing the theory. The single case can then be used to determine whether a theory’s propositions are correct or whether some alternative set of explanations might be more relevant.

The principal objective of the case study is to verify the IS-Impact model as an applicable theoretical framework capturing ES effectiveness in Chinese organizations. Therefore, a critical case that should be canvassed in the study is a Chinese organization that not only is using an Emprise System but also is harvesting impacts or benefits (perceived so).

All surveys and interviews, which are non-anonymous but confidential, were subjected to examination by the ethics committee of Queensland University of Technology. The case study is conducted within a Chinese joint-venture firm in the petrochemical industry. Due to the high level of sensitivity of the data and the initial confidential agreement between survey participant and the research team, the name of the participant enterprise is suppressed and designated as PETRO. Having used SAP R/3 since their establishment in 2001, PETRO now has 10 modules fully installed. Most PETRO employees have 5 years experiences with Enterprise System. The following section provides background information on PETRO.

5.3.3 PETRO’s business environment

PETRO was founded by China Petroleum and Chemical Corporation (Sinopec Corp.), Shanghai Petrochemical Company Limited (SPC) and BP East China Investment Company Limited with an investment of about $ 2.7 billion in a 30%,
20%, 50% proportion. It is by far one of the largest joint-venture petrochemical projects in China. PETRO is targeting the fast growing China ethylene market to gain a very significant share. As most local competitors are running under outdated technology and small capacity, PETRO distinguishes itself by high quality products through very advanced technology and equipment, and its low cost, from its world-class scale of facilities.

5.3.4 PETRO’s computing environment

PETRO developed an IT strategy and architecture in order to build up a highly automated production facility that would consistently deliver products of high quality and low cost. PETRO’s IT strategy is devised to achieve a high level of process and data management ability; below is a summarized IT strategy of the participant company.

- To leverage ‘Best Practice’ from joint venture Partners
- To seek out IT solutions to aid/enable business strategy
- To deliver IT solutions in line with the needs of the business in all phases of enterprise development
- To select and devise IT solutions that will realize the ‘paperless office’ concept
- To implement innovative solutions to drive efficient business process (e.g. SCM)

The three layers of IT Architecture of PETRO are depicted in figure 5.1: the first is the access layer which provides business users with access to the IS system. The second layer accommodates business applications such as ERP, BI, and Office Automation systems. The third is the platform, consisting of data storage, the network and the server systems.
Due to the large scale of data processing and management, it is a common practice in the petrol industry to launch an ES system before putting production facilities into operation. According to PETRO’s medium- to long-term business plan, the ES application were adopted to support PETRO’s whole supply chain including finance, logistics and warehouses, purchase, sales and quality factions, and most E modules would to be implemented before the primary manufacturing plant began to run in early 2004. Based on a comparison among three most popular ES systems, namely SAP R/3, Oracle and QAD, PETRO chose SAP, which dominates 90% of the petrochemical industry and which is currently being used by two parent companies of PETRO. In this case, PETRO can make full use of the industrial SAP templates and best practices of two parent companies.

Total implementation costs will be $38 Million, which is 1.4% of the total investment of PETRO and will match the industry standard. The ERP program included 3 phases: HR, purchase and plant management, and sales distribution & warehouse management. Each phase would be managed in 6 stages: project preparation, business blueprint, realization, final preparation, go live, and sustain.

With over five years of experience with their SAP application, PETRO is believed to be in the ‘mature stage’ of the enterprise systems lifecycle. Ross and Vitale (2000) suggests that the mature stage in ES lifecycle is the most appropriate time phase to assess the level of success. An initial context study of PETRO’s computing environment revealed that a large body of employees use the SAP R/3
system on a day-to-day basis for performing tasks ranging through financials, commercials, productions, and HR functionalities.

5.4 Survey instrument design

Given the essential idea of the identification survey, namely being open to the site and discovering the IS-Impact issues inductively from actual users, a survey instrument needed to be carefully designed. The candidate started with the original version of the identification survey instrument devised by Sedera (2005); thereafter the instrument has been modified, translated, tested and re-modified before and after the pilot test. This section will depict the instrument modification and translation work in detail, followed by a discussion of the pilot study.

5.4.1 The original survey instrument

The original survey instrument was devised in an Australian research context, to canvass a broad list of potential IS-Impact measures. This instrument includes two sections, (1) direct questions on respondent demographics (e.g., name, position, years with organization and a brief description of their involvement with the Enterprise); (2) an open-ended question to query respondents’ observations on the impact of IS. The intention to use one general open-ended research question is to not lead and limit the respondent’s thinking, but rather to let them reflect intensively on the question and then brainstorm the answer. Previous research results suggest that this questionnaire design was adequate to elicit citations that relate to both the impact and the quality of the IS.

5.4.2 Devising a Chinese version of the survey instrument

Devising a Chinese version of the instrument entails a series of efforts: (1) creating a Standard English instrument; (2) translating the Standard English instrument into Mandarin; (3) testing the face validity of the Mandarin version. Those actions are described in detail in this section.

5.4.2.1 The Standard English survey instrument:

One contribution of this research is to produce an instrument using the national language for the Chinese context. However, there is an issue in verifying the
research design and method when collecting data; therefore at first we constructed a standard English version of the instrument. The standard instrument was designed based on the Sedera (2005) identification survey instrument. Instrument design workshops with leading academics and research team members helped to devise an English version instrument for the Chinese context, based on the standard survey instrument. The workshop rephrased the single open-ended question, revisited the demographic questions and checked the equivalence of key-words and concepts in the instrument, such as ‘SAP’, ‘impact’.

5.4.2.2 Instrument translation

The researcher then adopted a one-way translation method to translate the modified English version instrument into Mandarin. Though many researchers recommend using a back-translation method when involving more than one language in a study (Behling and Law 2000; Mcgorry 2000), the candidate considered one-way translation to be the most appropriate and efficient method for this case.

In the back-translation process, the first translator will translate the standard survey instrument into Mandarin. The second translator then translates the Mandarin instrument back to English. This English version is called the ‘back translated version’. By comparing inconsistencies that exist in the two English version instruments, mistranslation can be located and then modified. This translation technique is widely used in instrument and scale translation in cross-cultural research, as it is credited with effectively finding and tackling issues such as the semantic equivalence of language and the normative equivalence of concept and subjects.

In one-way translation, like this study, the researcher does translation from English to Mandarin directly and independently, followed by an item-by-item proof-reading by other bilinguals. The reason for employing one way translation is twofold. On one hand, the normative equivalence of important concepts and constructs has been discussed and checked in the preceding standard instrument development workshop. Therefore, we are confident that Chinese respondents can understand the content of the instrument well when they are confronted with it. On the other hand, the instrument design is clear-cut and the research question is
straightforward. One-way translation can handle this instrument translation easily and efficiently. After translation, two certified translators were invited to check for translation equivalency. Some minor revisions were made in relation to grammar and inappropriate wording, but there were no changes to either the key concepts or the single open-ended question.

5.4.2.3 Face validity test

A group of Chinese students were then asked to check for the face validity on the Mandarin instrument. First of all, the researcher asked them to read through the instrument. It generally took those student five minutes to go through the overall questionnaire. Then the students were required to restate the open-ended IS-Impact question whereby the researcher could observe if they understood the questions properly. Lastly, they were requested to comment on the wording of the introduction, the overall instrument layout, the research question design, and then suggesting ways of improvements. The overall consensus of the Chinese student panel suggested that the Mandarin version IS-Impact instrument had adequate face validity.

5.4.2.4 Pilot study

The pilot test has strategic meaning to the overall study, as it must completely test the feasibility of the methodology. The pilot test acts as a rehearsal before the formal identification survey. Specifically, the purpose of the pilot test is twofold: (1) to test whether the original instrument design, where a questionnaire containing only one open-ended IS impact question, makes sense to Chinese respondents; (2) to check translation equivalence, as the research will be conducted in Mandarin in further surveys.

Fifteen PETRO SAP users were randomly selected for the pilot test. When selecting respondents, the researcher intended to cover each level of stakeholders in PETRO’s organizational hierarchy in order to canvass multiple perspectives of the impact of IS in a Chinese enterprise. The questionnaire was disseminated through PETRO’s internal email system as a MS Word attachment to the respondents. Finally, nine valid responses were gathered. As anticipated, the pilot test did not yield substantial
changes and it also indicated good translation equivalence between the English and Mandarin version instruments.

The pilot test demonstrated that all respondents clearly understood the research question and gave appropriate answers. However, based on the pilot test, it was found that the original open-ended IS-Impact question did not elicit responses pertaining to each half of the IS-Impact conceptual model adequately. The reason for this problem is probably due to the psychological profile of Chinese respondents when faced with an instrument containing only open-ended question: the Chinese seem to prefer specific questions over general questions. Additionally, they need trigger sentences and probing questions to encourage their reflection and help them to deliver quality responses. With this pilot test result, the instrument was then revised again before the formal identification survey was run. The final Mandarin version instrument will be discussed in the following sections.

5.4.2.5 The formal identification survey instrument

The survey instrument was translated into Mandarin for effective communication with participants, eliciting a maximum range of responses. The translation equivalence and question wording in Mandarin were verified in the pilot study prior to the formal Identification survey. Although the general IS-Impact question is able to canvass a response from a Chinese SAP user, the researcher decided to add another open-ended question about the quality of the SAP system. Furthermore, a section asking about system usage patterns of SAP user was included after the pilot study; information solicited here covered the years of experience with SAP, system usage frequency and pattern. This section provides more relevant information about Chinese users and their interaction with SAP, which aided in interpretation and the analytical potential of further study findings. Additionally, the inclusion of this section in the instrument was inspired by the recognition that diverse perceptions of SAP’s impacts can stem from the extent to which they are dependent on the system to perform the task. The more dependency on the SAP, the more impacts respondents might receive from SAP. As such, demographic and system usage behaviour questions enabled some insight into what each respondent brought with them when they commented on SAP system.
Therefore, the identification instrument was designed with three main sections (See appendix C). The first section elicited the respondent’s demographics: participant’s name, business title, department, years in PETRO, SAP module he/she uses most, and other SAP modules. A brief description of their involvement with SAP system was required as well. In the second section, respondents were asked to provide their system usage behaviour and their experience with SAP. In the third section, the respondents were requested to list any specific impacts associated with the SAP system and also to comment on SAP’s quality. The two general open-ended IS-Impact research questions are:

- **The SAP system has been installed in PETRO for four years. What do you consider have been the impacts of SAP in your company and in your work? (These impacts can be any results, consequences, changes or implications you have observed, be they strategic/operational, major/minor, positive/negative…….)**

- **Please comment on the quality of SAP**

A cover letter of the survey was also circulated to the targeted respondents with the instrument. It primarily outlined the purpose and duration of the study and introduced the researcher and the ITPS research team.

### 5.5 Data collection: Identification survey

#### 5.5.1 Sample selection

The identification survey was administrated in PETRO across 10 SAP modules and 5 functional departments: Financial, Commercial, Production, IT and HR. The total number of registered user ID in PETRO’s SAP user database is 480, but according to the SAP security and audit system used in PETRO, 188 accounts are active and used to log into PETRO’s SAP system in the latest 2 months. The SAP audit system will lock user accounts not being used within the past 2 months. We regard the 188 activated SAP accounts as the most favorable to be participants in the Identification survey. The appropriateness of the 188 activated accounts for disseminating the identification-survey was established through three main points.
The knowledge of respondents

Rather than focusing on every SAP user at PETRO, the Identification survey preferred to gain responses from a group of employees who are knowledgeable in SAP and who actually use SAP to perform working tasks. These employees were intimately familiar with the benefits, issues, changes and current status of the Enterprise System applications in their organizations. Therefore, it was anticipated that this sample of active users would provide the study with valuable insights of the impacts of SAP and would generate a broad range of impact items, satisfying the purpose to develop a localized IS-Impact model for Chinese organizations.

Spread of the sample

This sample consists of employees of various positions, ranging from senior managers and data entry operators to SAP system administrators, across 5 functional departments and 10 SAP modules. The variety of employment cohorts and multiple levels of involvement with SAP ensure the spread of the sample, thus promising a wide range of impact of SAP solicited from a complete spectrum of SAP users.

Increase the survey responses rate

A high emphasis was given to encouraging the maximum number of responses through the IT departments’ promotion and circulating the cover letter with senior IT manager’s signatory. An accurate sample helped the researcher keep track of each respondent and maximize encouragement of their participation.

5.5.2 The dissemination of the survey

As the respondents are explicitly targeted and the sample size is not particularly large, the response rate is a matter that especially concerned the researcher. Instead of administrating the questionnaire to all 188 targeted participants at one time, we distributed it by department to effectively trace and co-opt participation. To distil a complete and comprehensive set of Chinese version IS-Impact measures, the identification survey must achieve an adequate number of quality responses; thus we decide on a 60% response rate as a minimum for each department. Once the questionnaire had been distributed in a department, the participants were request to
send the questionnaire back within 2 weeks. Respondents would receive encouragement mail and a phone call before the closing time. When a department’s participating rate arrived at or exceeded 60%, the survey moved to another department. The identification survey questionnaire was sent and collected by the PETRO IT department through the PETRO enterprise mail system. The researcher received each batch of responses by the end of each department’s survey. We finally received 144 responses from the sample, providing a 77% response rate. Table 5.1 summarizes the sample profile of Identification survey.

<table>
<thead>
<tr>
<th>Department</th>
<th>Sample size</th>
<th>Number of respondents</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial</td>
<td>34</td>
<td>26</td>
<td>80%</td>
</tr>
<tr>
<td>Commercial</td>
<td>57</td>
<td>52</td>
<td>90%</td>
</tr>
<tr>
<td>Production</td>
<td>88</td>
<td>59</td>
<td>66%</td>
</tr>
<tr>
<td>IT</td>
<td>4</td>
<td>4</td>
<td>100%</td>
</tr>
<tr>
<td>HR</td>
<td>6</td>
<td>4</td>
<td>67%</td>
</tr>
<tr>
<td>Summary</td>
<td>188</td>
<td>144</td>
<td>77%</td>
</tr>
</tbody>
</table>

Table 5.1 The administration of the identification survey

5.6 The descriptive statistics of the respondents

5.6.1 A summary of descriptive statistics of respondents
Table 5.2 summarizes the descriptive statistics of the sample respondents. The 144 respondents have an average of 4.5 years in PETRO; more than 78% respondents have worked for the company for more than 4 years. Meanwhile, the sample respondents have an average of 3.7 years of experience with the SAP system; around 70% respondents have more than 4 years of experience with the SAP system. It is also observed that more than half of the sample respondents need to deal with more than one SAP modules in their daily work.
<table>
<thead>
<tr>
<th>Duration working with PETRO</th>
<th>Min</th>
<th>Max</th>
<th>Mean (Std)</th>
<th>Distribution</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>8</td>
<td>4.45 (1.500)</td>
<td>&lt;1 year</td>
<td>6</td>
<td>4.2%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1-3 years</td>
<td>25</td>
<td>17.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4-5 years</td>
<td>83</td>
<td>58.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;5 years</td>
<td>29</td>
<td>20.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>total</td>
<td>143</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Years of experience with SAP system</th>
<th>Min</th>
<th>Max</th>
<th>Mean (Std)</th>
<th>Distribution</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>8</td>
<td>3.72 (1.431)</td>
<td>&lt;1 year:</td>
<td>13</td>
<td>9.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1-3 year:</td>
<td>33</td>
<td>22.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4-5 years:</td>
<td>87</td>
<td>60.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt; 5 years:</td>
<td>11</td>
<td>7.7%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>144</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Numbers of SAP modules used</th>
<th>Min</th>
<th>Max</th>
<th>Mean (Std)</th>
<th>Distribution</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>6</td>
<td>1.90 (1.616)</td>
<td>1 SAP module:</td>
<td>69</td>
<td>47.9%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 SAP modules:</td>
<td>44</td>
<td>30.6%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 SAP modules:</td>
<td>15</td>
<td>10.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;3 SAP modules:</td>
<td>16</td>
<td>11.1%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td>144</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 5.2 The descriptive statistics of this sample respondents

The identification survey also included two questions to survey the level of usage of the SAP system in PETRO, including frequency of SAP system usage and pattern of SAP usage pattern. Two survey questions were scored on a seven-point Likert scale with the end value: 1) from (1) seldom /little usage to (7) Often/much usage for ‘Frequency’ question; 2) from (1) irregular usage to (7) regular usage for the ‘Pattern’ question. Table 5.3 shows that the valid 138 respondents reported a
substantially frequent usage of the system, scoring an average of 5.25 of 7. Meanwhile, the second question of ‘usage pattern’ generated 135 valid responses, with a mean score of 4.85, indicating a fairly regular usage of the SAP system in the company.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
<th>Std. Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP usage frequency</td>
<td>138</td>
<td>1</td>
<td>7</td>
<td>5.25</td>
<td>1.929</td>
</tr>
<tr>
<td>SAP usage pattern</td>
<td>135</td>
<td>1</td>
<td>7</td>
<td>4.85</td>
<td>2.039</td>
</tr>
<tr>
<td>Valid N (listwise)</td>
<td>134</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.3 The valid respondents of the identification survey

5.6.2 Classification of respondents

The identification survey received 144 valid responses from the PETRO Co. The data collection procedure of the identification survey placed a great emphasis on the spread of the sample. The 144 survey respondents were grouped and examined in terms of their employment cohorts, working function area and the SAP module they use most. Table 5.4 depicts the three types of classifications of the 144 respondents. It should be noted that the respondents are grouped mutually exclusively in each classification.

Firstly, the 144 respondents are grouped into 5 functionality groups according to the functionality in which they work. The identification survey covered five functions/ departments of PETRO, including Finance, Commerce, Production, HR and IT. The classification was straightforward and was made using the demographic data gathered through the identification survey, as respondents were required to answer their current employment in a specific department. Table 5.4 shows that most respondents came from the departments of Production (40%), Commercial (35.9%) and Financials (18.6%).

Secondly, the 144 respondents are grouped into SAP module groups according to the respondent’s mostly used module, as respondents self-reported in the survey. Ten SAP modules implemented in PETRO were included in the identification survey. Table 5.4 shows that, among the 10 modules, 25.2% of respondents work
mainly with the Material Management (MM) module, 20.3% respondents mainly use the Sales and Distribution (SD) module, 18.9% respondents primarily use the Plant Maintenance (PM) module, and 14.7% respondents use Financials (FI) module mainly.

Lastly, these sample respondents are classified into three mutually exclusive employment cohorts: 1) Management; 2) Operational staff, 3) Technical staff. The identification survey gathered demographic details on respondents’ employment title (e.g. director, Customer service representative, Business Analyst) and their involvement with the SAP system was used to classify the respondents into 3 employment cohorts. Note that rather than respondents self-reporting themselves into predefined cohorts, the researchers collected relevant demographic details to identify the employment cohorts and derive the classification. Table 5.4 depicts that the identification survey canvassed a large number of respondents from management and operational cohorts.

The researcher commented on the composition of the employment classification. As suggested in the introduction chapter (section 1.4), the researcher defined the study scope: ‘seeks to understand ES and its impacts from the point of view of Chinese users who directly use ES on a regular basis’. Hence, the identification survey deliberately solicited responses from the middle-level management including business managers and front-line managers, and the operational functions, such as administration staff, clerical staff, technicians, and other professional staffs who interact with the ES regularly and frequently. This survey excluded strategic management or top level management because this cohort seldom directly uses ES. Besides, and the access to this cohort is also a problem. Meanwhile, this survey also solicits responses from IT staff who work directly with the SAP system. This configuration of employment cohorts for the purpose of the identification survey is consistent with the composition of employment cohorts of other Enterprise Systems studies (Shang and Seddon 2002; Sedera, Tan et al. 2007).

In summary, the results of classifications of the sample respondents provide all indications of the spread of the sample.
<table>
<thead>
<tr>
<th>Demography</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Classification of stakeholder</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Management level</td>
<td>55</td>
<td>38.2%</td>
</tr>
<tr>
<td>Operational level</td>
<td>86</td>
<td>59.7%</td>
</tr>
<tr>
<td>Technical level</td>
<td>3</td>
<td>2.1%</td>
</tr>
<tr>
<td>Total</td>
<td>144</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Users in Functionality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>27</td>
<td>18.6%</td>
</tr>
<tr>
<td>Commercial</td>
<td>52</td>
<td>35.9%</td>
</tr>
<tr>
<td>Production</td>
<td>57</td>
<td>40%</td>
</tr>
<tr>
<td>HR</td>
<td>4</td>
<td>2.8%</td>
</tr>
<tr>
<td>IT</td>
<td>4</td>
<td>2.8%</td>
</tr>
<tr>
<td>Total</td>
<td>144</td>
<td>100%</td>
</tr>
<tr>
<td><strong>Modules</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Financial (FI)</td>
<td>21</td>
<td>14.7%</td>
</tr>
<tr>
<td>Control (CO)</td>
<td>6</td>
<td>4.2%</td>
</tr>
<tr>
<td>Material Management (MM)</td>
<td>36</td>
<td>25.2%</td>
</tr>
<tr>
<td>Human Resource (HR)</td>
<td>4</td>
<td>2.8%</td>
</tr>
<tr>
<td>Plant Maintenance (PM)</td>
<td>27</td>
<td>18.9%</td>
</tr>
<tr>
<td>Production Plan (PP)</td>
<td>11</td>
<td>7.7%</td>
</tr>
<tr>
<td>Sales and distribution (SD)</td>
<td>29</td>
<td>20.3%</td>
</tr>
<tr>
<td>PS</td>
<td>2</td>
<td>1.4%</td>
</tr>
<tr>
<td>Quality Management (QM)</td>
<td>5</td>
<td>3.5%</td>
</tr>
<tr>
<td>Warehouse Management (WMS)</td>
<td>2</td>
<td>1.4%</td>
</tr>
<tr>
<td>Total</td>
<td>143</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Table 5.4 The respondent's profile
5.6.3 Comments on the survey respondents

1. As suggested in prior section, the appropriateness of sample respondents was demonstrated through ‘the spread of the samples’ and ‘the knowledge of respondents’. This section firstly addresses the ‘representativeness of the sample’. The identification survey collected responses from a sample of 144 respondents, consisting of employees of various employments, ranging from senior managers, data entry operators to SAP system administrators, crossing 5 functional departments and 10 SAP modules. This section reported the configuration of the sample. Three types of classifications of the 144 respondents, by their functionality, the module used most, and employment cohort, were made and all indications addressed a good spread of the sample.

2. Another quality of the respondents, namely, the knowledge of respondents, was also indicated by the analysis of respondent demographics. The proficiency and competence of the respondents are emphasized in the identification survey. The optimal respondents for the survey should be intimate with the benefits, issues, changes and current state of the Enterprise System applications in their company. In spite of the explicit and declarative knowledge of the system, they ought to be well-informed about the business processes they work with. Based on their mutual understanding of the business processes and ES application, they are able to provide the study with valuable insights of the impacts of SAP and generate a broad range of impacts items, satisfying the purpose of develop in a localized IS-Impact model for Chinese organizations. These surveyed 144 respondents have an average 4.5 years of duration in the company as well as an average 3.7 years of experience with the SAP system. The years of experience and working duration are indicative of the degree of proficiency of both functional and system knowledge. This sample of respondents had sufficient exposure to the SAP system and familiarity with their business functions and process.

3. The demographics also inform the researcher of the level of system usage in PETRO. Most of the respondents used the system frequently, regularly and across multiple modules. This pattern of system usage indicates an instrumental usage of the SAP system in the company.
4. In spite of working with diverse functionality, PETRO’s user can be viewed as generally homogeneous in light of using SAP across 5 departments. The major observations made in relation to the ES involvement characteristics include: (1) Financial people have more experience with the system than people from other functionalities; meanwhile, Financial people need to cope with more modules compared to users in other department; (2) Commercial and Production employees rarely have prior experience with SAP system before joining PETRO. Statistics indicated that most end users in these two functionalities adapted themselves from total unfamiliarity with the SAP system to an experienced user with frequent and regular system utilization after they began work in PETRO.

5.7 Data analysis: an inductive and grounded approach

The study seeks out to ground subjective measures for evaluating the ES and ES-related impacts on Chinese ES users and organizations. Chapter 4 presented a generic discussion of inductive qualitative analysis. This section will give a descriptive account of the data-making process, namely how the analysis and coding is performed on the textual data collected in the identification survey. Qualitative research theorists indicate that detailed and explicit explanations about how a study deals with operational issues and methodological problems can assist in a good level of reliability and validity. This explanation is designed to enable independent observers to arrive at the same results when repeating the process.

This section reports the analysis of the qualitative data of the identification survey. This survey solicited Chinese ES users’ perceptions on the impact of ES and the quality of ES through two general open-ended questions. The approach resulted in a wealth of unstructured, exploratory qualitative data from 144 respondents in the participating organization. The researcher intended a rather top-down analysis approach to code qualitative evidence in the pilot study, but then realized the substantial deficiencies of the deductive approach. In the Identification survey analysis, the researcher determined to undertake a general inductive analysis of qualitative data, hence a set of analytical techniques collaborating Ground Theory
Method (GTM) and qualitative Content Analysis were employed. This section presents a descriptive account of the operations of the inductive analysis, documenting operational issues, decisions, procedures and examples of the analysis.

5.7.1 The theoretical commencement

As stated in the previous chapter, the specific evaluation purpose of an evaluation research will influence the data inquiry. This section aims to clarify how evaluation objectives of the qualitative IS evaluation study influenced the inductive analysis.

The IS-Impact measurement model (figure 5.2), proposed by (Gable, Sedera et al. 2008), was employed as the theoretical foundation informing the subjective IS evaluation. The IS-Impact model argues that a holistic measure for evaluation of an IS should consist of dimensions that together look both backward, and forward. The impact half measures net benefit of the ES to date; the quality half are the best proxy for measuring the impacts anticipated (Gable, Sedera et al. 2008).

![Figure 5.2 The theoretical foundation: IS-Impact conceptual model (Gable, Sedera et al. 2008)](image)

This conceptual IS-Impact model points to two general domains where a subjective IS evaluation study should investigate, whilst remaining open-ended to the specific content of each concept. Hence, based on the IS evaluation model, the study commenced the evaluation inquiry of the ES package from two aspects, namely, the quality of the artifact of the ES package as well as the impacts anticipated and realized by the ES package. Moreover, these two evaluation aspects have been coined as main research questions informing the data collection, data making, data analysis and inference development. This design was in line with Thomas’s (2006) general inductive approach, that ‘data analysis is guided by evaluation perspective
and objectives…the evaluation objectives and perspectives provide a focus and domain of relevance for conducting the inductive analysis (p.239)’.

Thomas (2006) also indicates that the upper-level concepts, namely the general themes, patterns, or core categories, are likely to be derived from the initial evaluation aims; the lower-level or specific categories or codes will be formulated from multiple reading, comprehending, and coding raw data. In line with this analysis approach, two broadly defined paradigms, namely, ‘IS Artifact Quality’ and ‘Impacts’ adapted from the IS-Impact model, were functioned as conceptual umbrellas under which all detail codes, IS-Impact items, subcategories and categories emerged from the data inductively.

In conclusion, this analysis is generally inductive but also is led by specific evaluation objectives and theoretical perspectives. Lincoln and Guba (1985) argue that the inductive approach is ‘not empty-headed but open-minded’. The researcher asserts that the underlying evaluation perspectives and theoretical perspectives benefit the study rather than being constraints. It points to a broad but most relevant domain where the researcher began this investigation. Working within the domain, the researcher was prevented from unnecessary distractions, assured always to be on the right analytical track, and was able to find grounded codes and categories effectively. The emerged codes and categories would ultimately enrich the IS-Impact domain with a wealth of empirical details and meaningful contextualization. Meanwhile, the specific evaluation objective and research questions were also fulfilled.

5.7.2 Overview of data coding

Coding is the first step in moving beyond concrete statements in the data, towards making analytic interpretation in qualitative analysis (Charmaz 2006). Coding is a way of forcing the researcher to understand what is still unclear, by putting names on incidents and events, trying to cluster them, communicating with others around some commonly held ideas, and trying out enveloping concepts against another wave of observations and conversation (Miles and Huberman 1994). As Charmaz (2006) summarizes, qualitative coding is a process defining what the data are about and beginning to grapple with what they mean.
The choice of coding method, technique and tools will depend on the objective of the specific study, size and amount of the data, funds and time available, and the researcher’s own experience. In this study, the author performed individual and manual coding assisted by a spreadsheet. Several operational issues were considered carefully prior to the coding exercise: (1) the coding exercise follows a structured procedure to ensure manageable data processing; (2) The spreadsheet files record each round of coding, and then one evolution from specific data to final general IS-Impact concept is traceable and logical. (3) Coding in Mandarin would occur for data gathered in Mandarin and (4) employing mature coding techniques, such as initial coding, focused coding from Grounded Theory methods (Strauss and Corbin 1998; Charmaz 2006), and pattern coding was applied as recommended by a seminal reference (Miles and Huberman 1994). A coding procedure consisting of four steps consolidated 633 IS-Impact citations from 144 responses into a code scheme. The scheme contains 60 IS-Impact codes (focused codes) in the measure level (first-order) and 6 IS-Impact categories in the dimension level (second-order). The 60 first-order codes load to 6 second-order codes hierarchically. They jointly constitute an organizing system which describes the phenomenon of IS-Impact in China.

5.7.2.1 Coding protocol

Prior to the data analysis, a coding protocol documents in detail both the procedure of inductive qualitative analysis and a self-coding process in detail. The purpose of this coding protocol is to strengthen rigor and reliability of the qualitative analysis, as this document served as a guideline informing the coding exercise. The coding protocol includes (1) coding techniques, (2) the theoretical foundation, (3) coding objectives, (4) coding guidelines (5) coding procedure, and (6) terminologies. The protocol was pilot tested with a sample of data. Some minor modification was made according to the experience achieved in the pilot test. The Appendix D describes the latest version of the coding protocol.

5.7.2.2 Using spreadsheet

The spreadsheet was employed as the coding and retrieving tool in the coding exercise. The researcher heeded the warning made by Strauss and Corbin (1998)
regarding the use of computer-aided tools in qualitative analysis, that ‘It is most important to understanding the philosophy of computer-aided text interpretation is the fact that computers and software are absolutely incapable of comprehending the meaning of words or sentences.’

The goal of this qualitative analysis is to logically arrange a large body of short text into a set of concrete and generalized concepts. The concepts are the prototype of measures which can be put into use to evaluate the packaged ES in the Chinese context. At one end, the input of the analysis is unstructured, shapeless raw data, and at the other, the output of the analysis is an IS evaluation framework consisting of a set of measures characterized as hierarchical, complete and mutually exclusive. Therefore, the coding process is to move data from unstructured to structured, and from the specific to general. Data is deducted, transformed and abstracted into analytical tag-‘codes’, then codes will be constantly created, revised, removed, merged and collapsed along with the increasing intensified analysis course.

Considering the specific objective of the qualitative analysis, the study used a spreadsheet as it is capable of assisting in all kinds of ordering, structuring, retrieving and visualizing tasks. Firstly, the data bit can be presented in a structured format, with one row containing one data bit. Moreover, as the data bit coming from one respondent is basically arranged in one spreadsheet page, it allows the analyser to focus on a particular piece of data as well as not losing the context. Secondly, similar to the traditional pen and printout approach, codes can be created adjacent to a piece of data bit. Specifically, the merit of using a spreadsheet is its flexibility, since it is convenient to add new marginal space (a column or a row) to a documented each intermediate stage in the coding process. The evolutionary course, whereby an early code is transformed into a concrete code, is recorded step by step.

As each round of codes maintenance is documented sequentially in the spreadsheet, this allows the researcher to retrieve each intermediate stage of the emerging IS-Impact evaluation framework. Assisted by the spreadsheet, the codes are gradually organized in a governing structure. Incrementally adding, removing, reconfiguring codes would not produce a ‘ragbag’ (Miles and Huberman 1994) that would induce a shapeless and unreliable analysis.
Other code and retrieval software, such as NVivo, had been used to experiment with some early data gathered in the pilot test; however, the researcher dismissed NVivo after this experiment. Although NVivo is powerful in managing, locating and displaying the data and associating codes, it is not capable of recording the intermediate course of early codes moving to consolidated codes. The design of NVivo also differs from the conventional qualitative coding exercise. The NVivo system creates ‘code’ as a ‘Node’. Each node functions as a document folder that accumulates the relevant dataset. The folder type design tends to dismiss the uniqueness of the data bit and restricts the analyst from microanalysis of the data bit. Considering all the possible merits and inconveniences of NVivo and of the spreadsheet, the researcher decided to employ the spreadsheet to conduct the qualitative analysis.

5.7.2.3 Coding in Mandarin

The analysis was undertaken in Mandarin, the language in which the data set was gathered. Strauss and Corbin (1998) advise that translation of raw data should be done minimally, because it is difficult to retain the nuance and subtleties of meaning in the translation. There is often no equivalent English word capable of capturing the subtle information of the original language; sometimes meaning becomes ‘lost in translation’ or has been contaminated by problematic translation. Furthermore, the researcher found additional difficulties in coding in English, as it was taken out of context and was hard to do analogous to the participants’ experience. Nevertheless, considering the convenience of supervision of the qualitative analysis and thesis, all data have been translated to English before the analysis. There are two occasions involving the translated data. One is for the thesis purpose. The research presents English citation since the study was published and reported in an English environment. The other is for the examination of the reliability of coding. Section 5.7 discusses this issue in great detail. In summary, the English versions of data and coding sample were supplementary; only the Mandarin versions of citations were employed in ongoing analysis.
5.7.2.4 Coding technique

The coding analysis employed a variety of coding techniques invented by different qualitative theorists, especially in the area of Grounded Theory Methodology. There are a myriad of coding techniques invented for varying types of data and research objectives. Preceding qualitative theorists suggest not taking any coding paradigm or technique as a fixed data analysis manual, but finding the appropriate way with regard to their particular analysis questions, data set and research goal. The research made rational choices of coding technique in line with the particular analysis goal.

(1) Open-coding (initial coding)

Sources include (Glaser and Strauss 1967; Strauss and Corbin 1998; Charmaz 2006).

Open coding is one of the essential ideas of the ‘grounded’ approach originally advocated by (Glaser and Strauss 1967). In open-coding, data are collected, written up, and reviewed line by line, typically within a paragraph. Categories, subcategories and labels are generated emergently, and a list of them grows. The labels are reviewed and, typically, a slightly more abstract category is attributed to several relevant incidents or observations. Open-coding is the first treatment in opening up the meaning of textual data.

(2) In vivo coding:

Sources include (Glaser and Strauss 1967; Strauss and Corbin 1998; Charmaz 2006; Saldana 2009)

The root meaning of ‘In vivo’ is ‘in that which is alive,’ and as a code refers to a word or short phrase from the actual language found in the qualitative data record, ‘the term used by participants themselves (p.38)’(Strauss and Corbin 1998). In vivo coding is the primary technique used during this initial coding; it will help the researcher retain much of the original observations from participants while conducting the conceptualization job.

(3) Focused coding

Source include (Charmaz 2006).
Focused coding follows initial coding. Focused coding searches for the most frequent or significant initial codes to develop ‘the most salient categories’ in the data corpus and ‘requires decisions about which initial codes make the most analytic sense’ (Charmaz 2006). In this coding scheme, focused coding is applied to identify the salient codes and concepts after initial coding, and then to facilitate the research to develop solid sub-categories and categories of the IS-Impact.

(4) Pattern coding

Source include (Miles and Huberman 1994).

Pattern coding is a way to group a large sum of data into a smaller number of sets, themes, or constructs. This coding pulls together a lot of material into a more meaningful and parsimonious unit of analysis (Miles and Huberman 1994). The application of pattern coding serves as a general guide which keeps the overall coding on the right track of answering research questions and dealing with research problem of this study. The inductive coding begins with two general coding themes that correspond to the two research questions in this study. All initial codes will be swept into the two domains for further coding, comparison and analysis.

5.7.3 Data coding procedure

This inductive, data-driven and bottom-up approach starts with a large body of short textual data at hand, allows plausible codes, sub-categories and categories grounded from the data, and finally constructs those emerged (sub-)categories into a measurement framework aiding in IS evaluation in Chinese organizations. As discussed in the previous chapter (section 4.5.3), the data coding can be compared to a process of data simplification and reduction. The data are reduced to their bare bones, stripped down to a simple and general form, and logically synthesized into a set of general concepts. The data is not forced into any extant specific codes scheme, but the codes find their own way to the data when they demonstrate sufficient analytical power to present the phenomenon and to scrutinize the rest of data.

In summary, coding is a dynamic, intuitive and creative process, involving inductive reasoning, thinking and theorizing. It starts with unstructured, specific and contextual statements, while finishing with a set of analytical and generalized categories. The coding exercise goes though a sequential process, including:
unitizing data, understanding data, deducting data then categorizing data. The first input is the very first dataset solicited from 144 response from Chinese packaged ES users; the final output is the categories which are able to be operationalized into an evaluation scale to assess IS performance and impacts in a Chinese context. The coding process is illustrated in figure 5.3. Table 5.5 also summarizes the four coding steps. Detailed descriptions and examples are described in the section below.

Figure 5.3 The summary of the coding process

<table>
<thead>
<tr>
<th>Coding step</th>
<th>process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1</td>
<td><strong>Preparation for data coding:</strong> Clean-up, sorting and translating raw data into a form that is ready to code. Decomposing citations from respondents’ paragraphs. <strong>Coding deliverables:</strong> A list of citations in both Mandarin and English, stored in Spreadsheet and Print-out.</td>
</tr>
<tr>
<td>Step 2</td>
<td><strong>Open-coding data:</strong> Discerning meanings of IS-Impact citations and labeling IS-Impact citations with a descriptive code – initial code. <strong>Coding deliverables:</strong> an inventory of initial codes.</td>
</tr>
<tr>
<td>Step 3</td>
<td><strong>Pattern-coding data:</strong> Connecting empirical data and initial codes with defined research questions, evaluation interests and theoretical perspectives of the IS</td>
</tr>
</tbody>
</table>
evaluation study. **Coding deliverables:** the initial coded data grouped under high-level pattern codes.

| Step 4 | **Focused-coding data:** Identifying the most significant and/or frequent earlier codes and raising them into focused codes. This step requires decisions about which initial codes make the most analytic sense to categorize. Condensing a large amount of unstructured qualitative data into an organizing system of categories. **Coding deliverables:** A data-driven and generalized categories pertaining to the phenomenon of IS-Impact in China. |

Table 5.5 The four step coding procedure

### 5.7.4 Coding step 1 – preparation for data coding

Prior to data coding, it is necessary to clean and sort the raw data into a form that is ready to code. The exploratory Identification survey yielded a wealth of Mandarin textual data appearing as a form of short paragraphs of responses to the survey questions. The first step of the data analysis involved (1) reading through the response paragraph to get the overall meanings of the data set, and (2) translating the Mandarin paragraph into English literally. It is necessary to stress that the English version data is used for communication and supervision convenience. The data analysis was performed on the original Mandarin data. (3) Unitizing data: decomposing the paragraph into the ‘unit of analysis’ and numbering the data bit. This section will describe the data unitization in detail.

#### 5.7.4.1 Unitizing data

According to Chapter 4, section 4.5.1, unitizing is the essential sub-process in content analysis. Krippendorff (2004) claimed that ‘Content analysis must justify their methods of unitising and must show that the information they need for their analysis is represented in the collection of units (p.83)’. Besides (Krippendorff 2004)’s texts of Content analysis, other qualitative theorists also stress the importance of segmenting data into the basic ‘unit of analysis’ (Tesch 1990; Dey 1993; Miles and Huberman 1994; Silverman 2005). Miles and Huberman (1994) suggest that the unit of analysis of data determines the levels of detail of a qualitative analysis; therefore, the researcher has to be sensible about what is the unit of analysis.
This study followed instructions of Content analysis in terms of defining and identifying unit of analysis. As discussed in section 4.5.1, Content Analysis recommends three types of data unit: sampling unit, recording/coding unit, and context unit. Specific to this study, the most relevant unitization are the latter two types of unit. Recording/Coding units are the basic elements bearing the information that the analysis is going to process (Steenkamp 2007). The recording/coding unit herein is defined as a ‘citation’. As stated in section 4.5.1, the study uses ‘theme’ as a recording/coding unit, rather than as another textual element, such as word, sentence, and paragraph. The term of ‘theme’ is taken to mean a semantically equivalent cluster of words with different meanings or connotations that, taken together, refer to some theme or issue (Steenkamp 2007). Hence, a citation is a singular quotation decomposed from a respondent’s statement. One citation pertains to one distinguished ‘theme’ in terms of Information Systems. Besides, context units are units of textual matter that set limits on the information to be considered in the description of recording/coding units. Recording/Coding units are embedded in a context unit. When coders render the meaning of a recording/coding unit, they need to comprehend the data unit against the overall textual context. The context unit herein is the paragraph from which a citation is decomposed.

The unitization delivered a large number of recording/coding units: 633 citations were isolated from all 144 respondents, with an average of 4.4 citations of each respondent. Each citation carries one ‘theme’ pertaining to the object of Enterprise Systems, including but not limited to the quality of ES, the performance of ES, and the outcome of the application. In some cases, one natural sentence was broke down into a couple of citations because the sentence consisted of multiple themes. In other cases, several sentences pointed to one citation since they jointly illustrate one theme. An example of decomposing respondents’ statement into citations is shown in the next sub section.

**5.7.4.2 The organization of the recording/coding unit**

A dual numbering system was also designed to ease the citation management and retrieval. Firstly, a sequence number was assigned to each citation in order to label who gave this citation. A running number was also assigned to each citation later
for the ease of locating the specific data bit. For example, in the citation of ‘16.58 Greatly enhance the working efficiency’, the first number of ‘16’ points to the No. 16 respondent who made this statement; and the second number of ‘58’ labels this as the 58th citation out of the 633 citations. This numbering system assists the analyst to locate specific citations from specific respondents effectively.

From the perspective of data unitization, a running number was appointed to the recording/coding unit, whereas the sequence number was appointed to the context unit. The dual numbering system facilitates the data coding significantly. Because inference cannot be made solely on the basis of the recording/coding unit (citation), referencing to the overall narrative carried in the context unit is essential. The numbering system helped coders to easily find the neighbouring citations and the original semantic context where the citation occurred.

The MS spreadsheet was found particularly useful for organizing citations and recording coding results. The researcher keyed in 20 citations per spreadsheet page. Hence, 633 citations were spread across 30 spreadsheet pages. The data coding was applied page by page. The researcher summarized and synthesized the coding results when a page was finished. The Spreadsheet allowed marginal space to be added freely. When the coder came to an analytical idea, codes or a comment, notes could be documented in new columns created adjacent to the citation. Figure 5.4 presents a print screen of a spreadsheet page carrying 20 citations.
Figure 5.4 A print screen of the Excel spreadsheet 1
The initial analysis of the 633 citations depicted a wide spectrum of relevant issues about packaged ES in Chinese organizations. The citations ranged through the quality of reports delivered by SAP, system reliability, the running speed of the system, and the system training needs of the user. The preliminary analysis of the citations was then discussed at a doctoral consortium with leading IS academics. All participants of the consortium workshop agreed upon the completeness and representativeness of the citations. The unitization yielded a vast pool of recording/coding units, from which the research could derive salient measures for the assessment of the IS-Impact in the Chinese context.

5.7.4.3 Example of unitization

This subsection gives a descriptive account of data unitization. A piece of raw data chosen from 144 responses’ paragraph is presented in Table 5.6. This real case illustrates the procedure whereby the paragraph was fractioned into citations.

<table>
<thead>
<tr>
<th>The Excerpt</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SAP</strong> 的使用对赛科产生了很积极的影响，是整个业务流程非常清晰，并得到控制。但是在一些业务情节的细节设置及业务流程的设置还存在不合理的情况。</td>
</tr>
<tr>
<td>The adoption of SAP impact PETRO positively. It crystallizes the business process and has the business process under control. However, a few inappropriate system configurations in terms of business operation and process do not match actual practice.</td>
</tr>
</tbody>
</table>

Table 5.6 An excerpt of statement

A qualified citation should live up to the three-fold criteria:

- **Uniqueness**: The narrative of each citation is different from its neighbour citations.

- **Readability**: The citation is a readable statement. Rephrase the decomposed data bit into a readable form but retain the original key-word – the ‘anchor’ of the citations.
• **Usability**: The narrative of citation should be concrete, specific and able to be coded. An ambiguous description and broadly general statement which presents insufficient information will not be regarded as a usable citation.

The unitizing data involves four steps:

1. Reading through a respondent’s paragraph to get the overall meaning of the paragraph

2. Finding the anchors contained in the paragraph. Anchor is the informative ‘key-word’ presenting the narrative of the paragraph. In this excerpt, five anchors, which communicate the key information of the paragraph, are identified. The anchors are highlighted below and the corresponding anchors in the Mandarin data are also presented. Table 5.7 illustrates the step of locating anchors.

### Finding anchors

<table>
<thead>
<tr>
<th>The adoption of SAP impact PETRO positively. It crystallizes the business process and has the business process under control. However, a few inappropriate system configurations in terms of business operation and process do not match actual practice.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(SAP 的使用对赛科产生了很积极的影响，是整个业务流程非常清晰，并得到控制。但是在一些业务情节的细节设置及业务流程的设置还存在不合理的情况。)</td>
</tr>
</tbody>
</table>

Table 5.7 Finding anchors

3. Breaking down the paragraph into meaningful and readable quotations according to the identified anchors. As the fourth quotation illustrates, a quotation can contain multiple anchors which combine to communicate complete information. The third quotation suggests that rephrasing sometimes is necessary for the sake of quality of readability. The excerpt of the paragraph is decomposed into four quotations. Table 5.8 presents the step of breaking down the paragraph.
1. The adoption of SAP impact PETRO positively.
   - It crystallizes the business process
   - The business process is under control.
   - However, a few inappropriate system configurations in terms of business operation and process do not match actual practice.

Table 5.8 Breaking down paragraph into quotations

4. Filtering the unusable quotations according to the above criteria and the rest of the quotations are raised to the recording/coding unit – citation. The unusable quotations are recorded and reviewed by double coders in a coding workshop. Specific to this excerpt, the first quotation is too general to discern any concrete information. It points to a broad ‘positive impact’ of SAP but mentions no specific impact of SAP. Hence, only the other three quotations are qualified as citations. Table 5.9 illustrates the step of consolidating quotations as the recording/coding unit – citation.

<table>
<thead>
<tr>
<th>Consolidating quotations as recording/coding unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>- It crystallizes the business process</td>
</tr>
<tr>
<td>- The business process is under control.</td>
</tr>
<tr>
<td>- However, a few inappropriate system configurations in terms of business operation and process do not match actual practice.</td>
</tr>
</tbody>
</table>

Table 5.9 Consolidating quotations as the recording/coding unit - citation

5. Numbering the citation. As discussed in previous sections, a dual numbering system was devised to organize citations. Firstly, a sequence number is assigned to each citation in order to label who gave this citation. A running number was assigned to each IS-Impact citation later for the ease of locating specific data bit. This excerpt comes from the No. 29 respondent and the citations running numbers are from 115 to 117. Table 5.10 presented the step of numbering citations.
29.115. It crystallizes the business process
29.116. the business process is under control.
29.117. However, a few inappropriate system configurations in terms of business operation and process do not match actual practice.

Table 5.10 Numbering citations

### 5.7.5 Coding step 2 – open coding

The second step in this inductive analysis is open coding each citation. This section corresponds to the previous discussion on ‘coding for meaning’ in Chapter 4. The term and technique of ‘open coding’ come from Grounded Theory method, which involves comprehending the manifest and latent meaning of the recording/coding unit. Open coding results in creation of ‘codes’, a short term or description, simultaneously summarizing and accounting for meanings conveyed by recording/coding units. Open coding is characterized by openness and microanalysis (Strauss and Corbin 1998), which requires the analyst remain open to whatever analytic possibilities can be discerned from the data and to create codes that best fit the data. This section provides a detailed account of the operations of open-coding in the analysis.

The operational issues related to this coding step are also elaborated.

#### 5.7.5.1 Citation Microanalysis

In this qualitative analysis, microanalysis is performed upon each citation. The researcher discerned each citation and developed an appropriate analytical tag – an initial code upon every single citation. According to seminal texts of GTM (Glaser and Strauss 1967; Strauss and Corbin 1998; Charmaz 2006), this open-coding, especially the microanalysis is so labour intensive that it applies only to the first batch of data set acquired from interview and/or focus group. Once some significant analytic direction, ‘pattern’, ‘category’, ‘codes’ are grounded, coders can sift the rest of data quickly by using the early identified codes. This exercise is called ‘focused coding’ (Charmaz 2006) or ‘selective coding’ (Strauss and Corbin 1998). Considering the particular research objective and the volume of data corpus, the researcher applied open coding on the overall
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Cao

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data throughout the 633 citations. Such a thorough data scrutiny assists in the content validity of the emergent IS evaluation framework. In other words, given that the IS evaluation framework should include a list of measures as complete as possible; a less rigorous data investigation will arguably overlook some important information.

5.7.5.2 The organization of open-coding

The organization and management of the coding exercise is very critical, as the analysis was to microanalyze each of the 633 citations, and each would be assigned at least one code to record the analytical idea. The data and intermediate coding results will become mixed and induce a disorganized situation if the coding lacks management. The actual open coding was conducted in the following steps: (1) commence with any spreadsheet page containing a set of 20 citations; (2) carefully scrutinize and generate initial codes to each citation until the page is finished; (3) apply pattern coding to the coded citation; the pattern coding partially functions as an early summary of the coding results within each set of 20 citations; (4) repeat steps (1) to (3) to open code the other spreadsheet pages; (5) synthesize and review tentative coding results once the researcher finishes every three spreadsheet pages.

5.7.5.3 Applying open-coding

Open coding is a lengthy and labour intensive process, but it was necessary to make the ‘themes’, ‘patterns’ and ‘categories’ grounded. While scrutinizing data citation by citation, the analyst constantly reflected on questions: what does this quotation suggest? What other meaning could it contain? Whenever a peculiar statement was encountered or a piece of new possible interpretation was formed, they were recorded as a memo. During the process of asking questions, writing memos and making constant comparisons, the researcher carefully generated the most appropriate conceptual labels (codes) to capture the theme implied by citations. It is noted that the open coding is not simply to summarize the data with a short description. It is a process starting to abstract the data into analytic concepts. Additionally, it is notable that, though the data was broken into pieces,
the meaning of the citation was still being examined in the overall semantic context.

5.7.5.4 Creating initial codes

‘Initial Codes’, as products of open coding, are created and constructed, and emerge during microanalysis (Strauss and Corbin 1998; Charmaz 2006). Qualitative analysis should make codes fit the data rather than forcing the data to fit codes. In this study, the names of codes come from two sources. First of all, in vivo codes, namely direct words or phrases used by participants, were employed whenever possible. An in vivo code is superior in preserving the meaning of the participants, and in retaining the nuance of data. The second source is from extant literature, for instance, the existing IS-Impact model and DeLone and McLean’s IS success model. If existing concepts are sensible to the data, the researcher would apply the concepts that are already established in the discipline in the analysis. The researcher understood that the use of established concepts might pose problems as well. The ‘borrowed’ name always carries particular meanings and exhibits associations with other contexts. Those meanings might influence the analyst’s interpretation of data and prevent the analyst from seeing the uniqueness contained in the new context. Therefore, though it might be advantageous at times for the analyst to use established concepts from literature, the researcher should always be cautious that each ‘pre-existing concept’ should earn its way into the study, rather than imposing them on top of the data.

5.7.5.5 Example of open-coding

Table 5.11 presents examples of open-coding based on the citations yielded in previous sections. Coders reviewed the citations until they comprehended the meaning. A concise descriptive tag – the initial code’ – was created to each citation. These examples illustrate how in vivo codes are created in the open-coding. The initial codes were adapted from the anchor identified previously, because the anchor is the cluster of words conveying the critical information of the citation.
Table 5.11 The examples of open-coding

<table>
<thead>
<tr>
<th>Open coding</th>
<th>IS-Impact citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystallize business process</td>
<td>29.115. <em>It crystallizes the business process</em></td>
</tr>
<tr>
<td>Business control</td>
<td>29.116. <em>the business process is under control.</em></td>
</tr>
<tr>
<td>Incompatible with practice</td>
<td>29.117. However, a few <em>inappropriate system configurations in terms of business operation and process do not match actual practice.</em></td>
</tr>
</tbody>
</table>

5.7.6 Coding step 3- Pattern coding

5.7.6.1 Applying pattern coding

Previous discussions suggest that, although the analysis was generally inductive and remained open to any analytical possibility, the specific evaluation interests and theoretical perspective of the study will influence the analysis positively. The evaluation interest informs the initial analysis direction while the theoretical perspectives point to a broadly defined conceptual domain within which the context-specific categories and codes are grounded.

The initial open-coding has scrutinized the contents of the data unit, and has yielded a large number of highly specific and descriptive ‘initial codes’ labelling each segment of data. At this stage, the researcher questioned how the preliminary coding results were associated with the evaluation interests, and how the context-specific codes and empirical data could be related to the theoretical perspective.

The researcher then utilized the technique of ‘pattern coding’ connecting empirical data, context-specific codes with theoretical perspectives and the evaluation objective. Pattern coding is a way of grouping a large sum of data into a smaller number of themes or constructs. This coding pulls together a lot of material into a more meaningful and parsimonious unit of analysis (Miles and Huberman 1994). Four general pattern codes increasingly demonstrated their analytical weight during the data analysis: (1) quality of IS Artifact, (2) Impacts, (3) User/Usage quality, and (4) IS support quality.
This inductive coding commenced with the two predefined general patterns of ‘IS artifact’ and ‘Impact’, which correspond to the two research questions and also correspond to each half of the IS-Impact conceptual model. Therefore, all initial codes and empirical data have been linked with the two domains. However, the researcher realized that a number of codes and data were hard to map into ‘IS artifact’ and were also not related to ‘Impact’; then two new patterns with respect to ‘User/Usage quality’ and ‘IS Support quality’ emerged. Hence, the data that had been open-coded was subsequently pattern-coded into four general patterns. The working definitions of the four pattern codes are presented in Table 5.12.

<table>
<thead>
<tr>
<th>Pattern codes</th>
<th>Working definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IS artifact</strong></td>
<td>The current state of the IS application (‘SAP R/3’ system) in PETRO, regardless of weakness or strength of the system commented by respondents. The application of SAP does not include IT infrastructure.</td>
</tr>
<tr>
<td><strong>Impact</strong></td>
<td>The consequence of using the IS artifact. The impacts of these artifacts on the humans (individual user) who directly (and indirectly) interact with them, also impacts on structures and contexts within which they are embedded, and associated collectives (organizations)</td>
</tr>
<tr>
<td><strong>User/usage quality</strong></td>
<td>The characteristic of human actor (system users), knowledge, skill and attitude, etc, related to the specific IS artifact. The human behaviours reflected within, and induced through, direct and indirect usage of these artifacts</td>
</tr>
<tr>
<td><strong>IS support quality</strong></td>
<td>The managerial, methodological, and technological capabilities as well as the managerial, methodological, and operational practices for directing and facilitating IT artifact usage and evolution in the stage of</td>
</tr>
</tbody>
</table>

4 The general pattern of ‘IS Support Quality’ is in the broader sense analogous with ‘IT managerial, Methodological, and technical capabilities and operational practices’ in the Benbasat & Zmud (2003) IS Nomological Net. Hence, the working definitions were adapted from Benbasat & Zmud (2003)’ description of the ‘IT capability and practice’.

5 The IS Nomological Net indicates that a core set of high-level concepts in the IS-Net are broadly related to the performance of an IS artifact. Gable et al. (2008) reconcile the IS-Impact model and the IS Success model with the IS-Net, suggesting the high-level concept of ‘usage’, ‘IT practice’ and ‘IT capability’ are also relevant constructs in exploring the phenomenon of IS-Impact. The upper-level pattern codes of ‘user/usage quality’ and ‘IS support quality’ were theoretically supported by this literatures.
The following examples show the processes of reviewing the open-coded citations and the considering general theme of citation. Anchors and initial codes are regularly compared with the working definition of patterns.

- If the anchor/initial codes present key information related to feature, characteristic, performance, quality, attribute pertaining to the specific IS artifact (SAP), the citation should be pattern-coded as ‘IS Artifact Quality’.

- If the anchor/initial codes present key information related to impact, influence, effect, consequence, result, outcome of the usage and adoption of the IS Artifact (SAP), the citation should be pattern-coded as ‘Impact’.

- If the anchor/initial codes present key information related to user, user skill, user knowledge, user competence, user credibility and the user involvement regarding interaction with the IS Artifact (SAP), the citation should be pattern-coded as ‘User/Usage quality’.

- If the anchor/initial codes present key information related to system maintenance and support of specific IS Artifact (SAP), the citation should be pattern-coded as ‘IS support quality’.

The initial codes and the number of associating citation were brushed into corresponding patterns. Table 5.13 presents the example of pattern-coding based on the citations and open-coding results derived in previous sections. In the excerpt, No. 29.115 and No.29.116 demonstrate two types of effect derived from SAP; therefore they were mapped into ‘Impacts’. No. 29.117 demonstrates an aspect of system quality, and therefore it was mapped into ‘IS Artifact quality’. No example citations extracted from the excerpt relate to
‘User/Usage quality’ and ‘IS support quality’. The pattern coded excerpt is shown below.

<table>
<thead>
<tr>
<th>Pattern coding</th>
<th>Open coding</th>
<th>IS-Impact citations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IS Artifact quality:</strong> Incompatible with practice, 29.117</td>
<td>Crystallize business process</td>
<td>29.115. It crystallizes the business process</td>
</tr>
<tr>
<td><strong>Impacts:</strong> Crystallize business process, 29.115; Business control: 29.116</td>
<td>Business control</td>
<td>29.116. The business process is under control.</td>
</tr>
<tr>
<td><strong>User/Usage quality</strong></td>
<td>Incompatible with practice</td>
<td>29.117. However, a few inappropriate system configurations in terms of business operation and process do not match actual practice.</td>
</tr>
<tr>
<td><strong>IS support quality</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.13 Examples of pattern-coding

5.7.6.3 Standardizing initial codes.

Another function of pattern coding is to standardize and consolidate the content-specific initial codes into more general codes. The general codes are easy for further comparison and generalization. The major activity includes:

- combining identical codes into a single code;
- combining similar codes, if their associating IS-Impact citation contain the same anchor (key words);
- combining codes with different wording, but pertaining to similar issue. Review if the original IS-Impact statements contain replaced synonyms. A list of synonyms is considered using a thesaurus,
removing value description. The code of ‘very slow system response’ is modified as ‘system response time’

constructing codes in a neutral statement. For example, the code of ‘better decision making’ is modified as ‘decision making’

Table 5.14 presents an example of initial codes standardization. In this excerpt, the content-specific initial code of ‘Incompatible with practice’ was consolidated into a standard initial code of ‘system compatibility’ by removing the negative description and rewording.

<table>
<thead>
<tr>
<th>Pattern coding</th>
<th>Pattern coding</th>
<th>Open coding</th>
<th>IS-Impact citations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IS Artifact quality:</strong> System compatibility, 29.117</td>
<td><strong>IS Artifact quality:</strong> Incompatible with practice, 29.117</td>
<td>Crystallize business process</td>
<td>29.115. It crystallizes the business process</td>
</tr>
<tr>
<td><strong>Impacts:</strong> Crystallize business process, 29.115; Business control: 29.116</td>
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</tr>
<tr>
<td><strong>IS support quality</strong></td>
<td><strong>IS support quality</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5.14 Examples of initial codes standardization

5.7.7 The coding result from open-coding and pattern-coding

Reviewing the coding procedure from data unitization to pattern coding, the unstructured textual data has been transformed into a hierarchical system of descriptive codes. The figure 5.5 summarizes the transformation of the excerpt that the thesis uses throughout the earlier sections. The excerpt is extracted from a respondent’s statement regarding observed impacts of packaged
enterprise systems (SAP R/3 system) since the system was installed in his/her organization (PETRO). Three themes emerged from the short statement through constant reviewing, reflecting and comparing, and three initial codes were developed to document the themes. The initial codes are ‘system compatibility’, ‘crystallized business process’, and ‘business control’. The researcher has also concerned with the connection between the identified themes and the IS evaluation objective, research question and theoretical foundations. Hence, the three themes were pattern coded into the two general patterns indicative of the theoretical issues. The analysis suggested that ‘system compatibility’ is a salient characteristic of the quality of the Enterprise System. The theme of ‘system compatibility’ is supposed to relate to the pattern of ‘quality of the IS Artifact’. Nevertheless, it further suggests that one way to evaluate an ES in the Chinese context is to evaluate the extent to which the system is compatible with the business practice. Finally, the analysis also suggests that the theme of ‘system compatibility’ might be a component necessary for making sense of the upper level concept of ‘IS Artifact quality’ in the specific research context.

The excerpt of respondent’s Statement:
The adoption of SAP impact PETRO positively. It crystallizes the business process and has the business process under control. However, a few inappropriate system configurations in terms of business operation and process do not match actual practice.

Figure 5.5 Transformation from textual data to a provisional codes system

5.7.8 Coding step 4 – focused coding
This phase of the analysis was focused coding, which occurred after some strong analytic directions emerged through the initial coding and pattern coding. At this stage, the researcher began to use the most significant and/or frequent earlier
codes to sift through larger segments of data (Charmaz 2006). However, attention was also paid to the possibility of significant new codes emerging from the data.

Which initial codes will be raised to a focused code, namely, a theoretical concept? The codes which render the data most effectively will be raised to theoretical concepts. Those codes/categories have ‘carrying capacity’ because they carry substantial analytic weight. The analytic weight means containing crucial properties that make data meaningful and carry the analysis forward (Charmaz 2006).

Focused coding functioned as data deduction and data categorization in the inductive analysis. The methodology issues related to ‘data reduction’ and ‘data categorization’ were discussed in section 4.5.3 and section 4.5.4. This section will present an account of the operational issues in reducing and categorizing data through the technique of focused coding.

5.7.8.1 Creating focused codes

The focused codes are generated two ways. On the one hand, the frequently appearing initial codes become a focused code. On the other hand, a couple of initial codes, sharing similar properties and dimensions (Strauss and Corbin 1998), or pertaining to the same theme, were eligible to merge into a focused code. Grouping initial codes into focused codes is important because it enables the analyst to reduce the number of units with which the researcher is working. When the researcher assigned a focused code on top of a couple of initial codes, all of the initial codes became properties or explanatory descriptors of the upper-level code. Three guidelines were drawn in terms of creating a focused code:

- Where the initial code accumulates a number of citations, raise the initial code as a focused code.
- Where identical initial codes exist, merge them together then raise it as a focused code.
• Where similar initial codes exist, review the respective citations tagged with the codes; if most anchors of these citations are synonyms, then they can be consolidated into one focused code.

Focused coding requires decisions about which initial codes make the most analytic sense to categorize data incisively and completely. This round of coding is an evolutionary process, requiring continuous comparison of data with data, data with codes, codes with codes, and codes with upper-level codes across respondents’ responses. As discussed in the previous chapter (section 4.5.6), ‘counting’ is an alternative technique complementing the qualitative treatment of textual data. Here, the researcher counted the frequency of the appearance of an initial code. The frequency of initial codes indicates the magnitude of the issue or, in a broad sense, suggests the extent to which the respondents were aware of the issue related to their enterprise systems. The higher the code cited, the more significant may be the code and the issues that the code stands for. However, the researcher was also aware that frequency is not necessary evidence showing the significance of IS-Impact items. It is not the case that a code with a count of 10 is much more critical than another code with a count of 5.

5.7.8.2 Maintaining focused codes

The focused coding involves playing with and exploring the codes and categories that were created (Coffey and Atkinson 1996). It is noted that codes are not cast in stone, and can be abandoned, changed, re-sorted, or renamed once the analyst discerns the codes incapable of abstracting the data that they intend to. Guidelines were established to maintain provisional focused codes:

• The early initial codes which were not populated would be upgraded to focused codes when more data inscribed their significance.

• Where an initial code is difficult to map into each of the early focused codes, create the specific initial code as a new focused code.

• Where a focused code consists of manifold and varying issues, it will be broken down into more specific sub-codes.
Where multiple focused codes pertain to the same issue, with their citations carrying the similar narrative, those early focused codes will be merged as a more general one.

As the second guideline shows, the researcher also paid more attention to those which do not ‘fit’ into the existing codes. The exceptions, misfits, and negative incidents, events, and individuals were seen as having as much importance to the process of coding as do the easily coded ones (Coffey and Atkinson 1996).

5.7.9 **Sorting codes into an organizing system of category**

Having gone through the steps of data unitizing, initial coding, pattern coding and focused coding, the data corpus were condensed into a list of meaningful codes, each carrying different content about IS-Impact and working as a label categorizing data segments. At this stage, the data was fractured and shapeless. The codes family was still unable to tell a coherent story of the phenomenon of IS-Impact under investigation. The codes family had to be organized into a form to describe a compiling theory. Therefore, this analysis step is to sort codes into an ‘organizing system of category’ (Tesch 1990). Given that the study goal is to identify a context-specific IS success evaluation model, the organizing system of category will account for a hierarchical IS success/effectiveness evaluation model, with the constitution of specified measures and dimensions.

Qualitative research texts suggests organizing scattered codes and concepts around one ‘core category’ or more (Strauss and Corbin 1998). Saldana (2009) argues that the central or core category functions like an umbrella that covers and accounts for all low-level codes and categories formulated thus far in a qualitative analysis. Core category accounts for most variations of the central phenomenon around which all the other categories and sub-categories are integrated (Strauss and Corbin 1998). In this study, the core category is ‘IS-Impact in China’ and the researcher assembles emergent codes around this central concept. Rather than being grounded from the process of analysis, this core category is predefined, running through the entire study. However, we state that the decision of core categories is appropriate and applicable for the
study, as it is the investigation of interest and the evaluation object of the IS evaluation study.

Qualitative data analysis ultimately looks for commonality, patterns and themes from a large body of a qualitative data set. It is akin to an informal exploratory factor analysis, as a large amount of data is intuitively correlated (subjectively evaluated) and judgmentally combined into factors (Lee, Mitchell et al. 1999). Thus, surrounding the core category of the IS-Impact in China, the researcher further attempted to identify major ‘factors’ from the family of codes discerned in previous coding cycles, and then integrating focused codes around major factors.

Although the coding procedure was described and presented in a linear fashion, the emergence of codes sorting started at the step of pattern coding, where the citations and associating initial codes were tapped into the most related pattern codes. At the very early stage of coding, pattern codes implied two main investigations of interest and analysis directions – ‘the IS artifact’ and ‘impacts of the IS artifact’. The pattern codes did not posit any concrete dimensions of IS success/effectiveness as well. As more data has been scrutinized, more analysis has been made and more codes have been accumulated through the evolving coding course, the boundary and content domain of pattern codes has been gradually delineated. Two more pattern codes related to ‘User/Usage’ and ‘IT Function’ have been created to accommodate data and codes falling beyond the initial pattern codes. Under each coding patterns, dimensions progressively emerged through constant sorting and comparing codes, data corpus, and theoretical ideas documented in memos.

Constant comparisons were made to see how one code theoretically related to its properties and also to other codes. Diagrams were used to enable visual representation of the relationships among the codes and to facilitate thinking at an abstract level. Resorting of the codes occurred when they fitted somewhat differently. The researcher kept on sorting, comparing and resorting until the large number of codes packed into several high-order categories, which is a basic social psychological process, emerged in this study.
After the theoretical codes-sorting and comparisons, 60 focused codes were consolidated into 6 categories, instantiating the core category of ‘IS-Impact in China’. The 6 categories are ‘System Quality’, ‘Information Quality’, ‘Impacts on Organization’, ‘Impacts on Individual’, ‘IS Support Quality’ and ‘User Quality’. Those six categories were theoretically integrated to depict the phenomena of the IS-Impact in the Chinese context and to facilitate the evaluation of success of Enterprise Systems in Chinese organizations. The 6 categories and their associating measures are presented in Chapter 6.

Of note, by and large, the first four categories correspond to the existing dimensions in the IS-Impact model (Gable, Sedera et al. 2008) and its predecessor the IS Success model (DeLone and McLean 1992). The researcher employed the same terms to name categories (dimensions) in the emergent model for several reasons. Firstly, though the measure level of the contextualized IS success evaluation model was developed inductively, it is hard to claim that the higher-level categories are free from the influence of existing theory and models of IS Success/evaluation. Secondly, the study is very cautious about creating new terms for categories. Idiosyncratic names will only add confusion and impede comparisons between studies. Thirdly, it is noted that, though the specific content of each dimension was instantiated with contextual measures, those categories point to very similar domains that have been defined well by the preceding studies. Thus, continuing to use the previous terms exhibits the theoretical underpinnings of the study and also aids in the knowledge accumulation of the study discipline.

It is important to emphasize that coding is not a precise data reduction technique, but is rather an interpretation of meaning and a process of abstracting concepts out of data corpus. Categories and themes do not emerge from data automatically and passively; rather, intuition and tacit understanding of data facilitate the emergence of categories. At some stage of the analysis, the researcher moved from the data to consult with the literature and engage with previous IS evaluation research to allow theoretical reflection and speculation on the emerging categories and themes.
5.7.10 The quality of the category system
The section 4.5.5 articulated that the output of this inductive analysis is an organizing system of categories. Four criteria were established to determine the goodness of this organizing system. The criteria are 1) Completeness of categories, 2) mutual exclusivity of categories, 3) instantiation of categories, and 4) appropriate hierarchy of categories. This section described how the pursuit of qualities of the category system was addressed by the analysis.

Completeness of categories: After focused coding, 60 focused codes emerged from the data set. The researcher attempted to demonstrate the quality of completeness through the steps of ‘unitizing data’ and ‘open-coding’. The analysis unitized the data corpus into 633 recording/coding units, which is a vast pool covering a wide range of issues related to the topic. ‘Open-coding’ facilitated a careful scrutiny of each data unit and created a complete list of early codes.

Mutual exclusivity of categories: The steps of ‘pattern coding’ and ‘focused coding’ contribute to the development of mutually exclusive codes. A systematic comparing, sorting, maintaining the early codes aids in understanding similarity and difference between codes, and drawing the boundary of the domain of codes.

Instantiation of categories: Codes are instantiated with data segments that seek to reflect the code. Meanwhile, focused-coding quantifies data units as frequency of codes. The frequency also indicates the instantiation of a code.

Hierarchy of categories: Accompanying the generation of focused codes, they were gradually organized into a hierarchical system, where 6 higher-order categories cover 60 lower-level categories (focused code).

5.7.11 The organization of coding
Although the coding procedure is presented in a linear fashion, the coding activity was conducted iteratively. 633 citations were organized into 30 page of spreadsheet, with each page carrying 20 citations. The coding was done page by pages. Each page of 20 citations went through open-coding and pattern-coding until citations were transformed into standard initial codes. Having processed three pages of citations and accumulated a list of standard
initial codes, at this stage the researcher was able to begin focused coding. The focused coding yielded a provisional focused codes family based on the early coding results.

After processing the first three pages of citations, the researcher randomly picked up another three pages of citations, performing the same coding procedure (including open coding, pattern coding and focused coding), and developed a second set of provisional focused codes. Subsequently, the researcher used the newly developed focused codes to review the early focused codes, and consolidated them into a strengthened version. Each coding iteration and codes review constituted a coding round (Hruschka, Schwartz et al. 2004), and each coding round involved processing three pages of citations. Therefore the 30 spreadsheet pages, with a total number of 633 citations, entailed 10 round of coding to scrutinize, maintain, modify and consolidate the early codes into an organizing system of categories.

5.7.12 Comments on using a single coder
This overall coding was performed by a single coder. The researcher herself read the textual data, coded the content of the data and arranged the data into an organizing system of categories. A second coder was involved in a reliability assessment session only – double-coding – for the purpose of confirming the reliability of the coding process and categories.

The advantage of self-coding is economy and convenience in a resource constrained situation. In this study, data was collected in a Mandarin context while the coding process and results are reported in an English environment. Multiple bilingual coders are not attainable. Moreover, the approach of inductive data coding is a somewhat ‘self-contained’ exercise. The coding process allowed the researcher to communicate and connect with the data intensively, attaining an in-depth comprehension of the phenomena, and generating theory in the data (Basit 2003). In other words, this comprehension and theorizing is attained through the intensive interaction with data that only the individual researcher can afford, and is also based on an extensive familiarity with the context that only the individual researcher can acquire.
The disadvantage of self-coding is its reliance on individual reasoning and
judgements. Inevitably, subjectivity and the validity of coding results is always
the subject to be criticized. However, the researcher argues that those
weaknesses can be effectively moderated by a set of solid coding criteria and a
coding scheme. Following the systematic coding steps, the data analysis is
structured with less randomness and fewer mistakes.

Steenkamp (2007) argues that using multiple coders does not necessarily
guarantee the reliability and validity of content analysis. He cited (Krippendorff
2004) that ‘even though most investigators publish respectable indices of
inter-coder agreement in categorizing the responses, these are open to serious
questions. Usually the published inter-coder agreement is based on two people
who have worked together intimately in the development of a coding scheme,
and who have engaged in much discussion of definitions and disagreement
(p.130)’. Hence, we could interpret the comment: two coders engaging in the
same event and receiving the same training may hold the same conceptual
system, prejudice or interests. They may well agree on what they see but this
does not mean their agreements are objectively correct. Thus the inter-coder
agreement could be misleading regarding the reliability of a study, and, also, the
stable and replicable process may or may not lead to a valid outcome.

In the meantime, Steenkamp (2007) also indicates that ‘in principle, a single
coder is sufficient, since well-specified decision categories with well-specified
decision rules reduce the need for multiple coders (p.100)’. As a matter of fact,
the reliability and validity of a single coder’s analysis of data, processes and
study findings are not inferior to those of multiple coders. The substance of
reliability and validity does not depend on the number of people doing the
coding; rather, it depends on how rigorously and logically the data has been
processed and the inference that has been made. The detailed descriptive account
of the data coding presented in this chapter is an effort to make the self-coding
more comprehensible to readers and examiners. The double coding, discussed in
the subsequent section, is another approach by which the study demonstrated the
reliability of the analysis.
5.8 Data analysis reliability

Reliability is synonymous with ‘dependability, stability, consistency, predictability, accuracy’. Reliability is usually tested by replication, for example, the test-retest assessment or parallel forms correlation. Wimmer & Dominick (2003) comment, ‘A study is reliable when repeated measurement of the same material results in similar decisions or conclusions (p.156)’. Silverman (1998) defines reliability as ‘the degree of consistency with which instances are assigned to the same category by different observers or by the same observer on different occasions (p.175)’. Reliability is not prized for its own sake but as a precondition for validity (Lincoln and Guba 1984). Reliability is an important criterion in judging the ‘trustworthiness’ of qualitative research. In this study, the researcher attempts to strengthen the reliability of the inductive data analysis by testing the stability and consistency of the coding process and results. Two types of reliability examination techniques, including intra-coder agreement and inter-coder reliability were employed. A generic discussion on the reliability of qualitative analysis was presented in section 4.6. This section will demonstrate how reliability was managed in this study.

This reliability assessment, titled as double coding, entails several steps: choosing a subset of codes and associating citations for double coding; creating an instrument for the double coding; double coding the chosen citations, and assessing reliability. Each step will be described in sub sections below.

5.8.1 Introduction of double coding

The double coding activity is adapted from techniques of assessing reliability in content analysis. The objective of double coding here is to test the stability and consistency of the coding process. The stability is examined in the test-retest form: the researcher herself recodes a sample of citations in the double coding, and intra-coder agreement is calculated. Furthermore, consistency is examined in the test-test form; namely, another researcher who was not involved in the initial coding is invited to code the same sample of the
citation, and the inter-coder reliability is assessed between the two coder’s results. The underlying assumption is that the agreement rates demonstrated by the double coding are indicative of the reliability of the coding. An acceptable level of agreement will suggest a good degree of stability and consistency of the coding procedure and coding results.

It is noted that the double coding is adapted from the inter-coder reliability test but is different in several aspects. Firstly, regarding texts in Content Analysis, ‘inter-coder reliability’ often emphasizes ‘reproducibility’ (Krippendorff 2004); however, this double coding is not attempting to test ‘reproducibility’ of a coding procedure. Secondly, all coders are involved from the early stage of analysis in a traditional ‘inter-coder reliability test’. They acquire substantive intimacy with the coding procedure, and collaborate in the development of a codes scheme. In this scenario, an inter-coder reliability test aims to ensure the quality of the codes scheme which will serve as an a-priori framework for the subsequent coding exercise. However, this double coding is conducted at the end of the coding process. The developed codes scheme and the inductive coding procedure are the ultimate theoretical findings yielded from the analysis. In this scenario, the double coding aims to ultimately evaluate the quality of those findings. Thirdly, an inter-coder reliability assessment requires multiple coders to go through a fixed procedure and process the data according to a rather fixed codes scheme. In this sense, researchers are able to examine whether the findings are reproducible in the same procedure by different coders. However, no such fixed codes scheme exists in an inductive analysis. An inductive analysis usually attempts to make the data into an emergent and evolving coding scheme along an evolutionary coding course. The codes scheme remains active until the last piece of citation is coded and no further modification is suggested to the codes scheme. Hence, it is not attainable to reproduce an inductive coding exercise. Given the reasons above, in order to assess the reliability via the double coding, the researcher asked the second coder to map the citations into the codes scheme developed, rather than asking him/her to replicate and reproduce the coding procedure. It is argued that the
mapping results are indicative of sufficient reliability of the coding, if the
double coding is designed and proceeds soundly and rigorously.

5.8.2 Choosing a subset of codes

Initial coding identified 60 codes organised into 6 categories: 1) Individual
Impacts, 2) Organization Impacts, 3) System Quality, 4) Information Quality, 5)
User Quality, and 6) IS Support Quality.

The double coding utilized a sub set of codes instead of testing 60 codes overall.
Sixty is an unmanageably large number for double-coding. The literature
suggests that dealing with a large number of codes will made coding decisions
very difficult. Restricting the number of codes below 20 will ease coding
decisions, yet is feasible for verifying the reliability of the coding process
(Hruschka, Schwartz et al. 2004). A subset of 21 of these 60 codes was chosen
from across the 6 categories based on their frequency of citation. Burla,
Knierim et al. (2008) indicate that codes cited in low frequency are often
narrowly defined and pose little challenge to acquire a higher rate of coding
agreement. Hence, those cited most frequently were employed in order to avoid
an oversimplified double coding. The cut-off was the top 3 most frequently
cited codes in each dimension, and those which have been equally cited were
also included in the double coding. Table 5.15 indicates the selection of the
subset of the codes.

<table>
<thead>
<tr>
<th>Individual Impacts</th>
<th>Organization Impacts</th>
<th>System quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ease to do work (72)</td>
<td>4. Information transparency (31)</td>
<td>7. System feature and functions (41)</td>
</tr>
<tr>
<td>2. Improve individual productivity(27)</td>
<td>5. Enterprise management optimization(21)</td>
<td>8. Ease to use(31)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. System response</td>
</tr>
</tbody>
</table>
Table 5.15 Sub-set of codes tested in the double coding

<table>
<thead>
<tr>
<th>Information Quality</th>
<th>User Quality</th>
<th>IS Support Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Data availability(17)</td>
<td>15. User system dependency (9)</td>
<td>18. End user training (16)</td>
</tr>
<tr>
<td>12. Data integration(10)</td>
<td>16. Breadth of system usage (User’s task) (9)</td>
<td>19. Regular maintenance (9)</td>
</tr>
</tbody>
</table>

5.8.3 Development of instruments for double coding

The instrument of double coding includes a coding protocol and a copy of the coding-book. This protocol should be read in conjunction with the coding-sheet. The coding protocol contains the subset of 21 codes previously chosen, that is 36% of the 60 codes are tested in the reliability test. Each code incorporates a short description and one or more examples of a citation. These 21 codes are organized in 6 clusters pertaining to the 6 higher-order concepts. The hierarchical arrangement of codes facilitates coder reasoning when they deal with a large chunk of data. Coding guidelines and coding rules are also included in the protocol. The coding-sheet contains 404 citations which pertain to the 21 testing codes. These citations are listed randomly in the coding-sheet. The double coding protocol is presented in Appendix E.

5.8.4 Assessment of intra-coder agreement

The double coding employed techniques consisting of test-retest for assessing the stability of coding and a test-test for assessing consistency of coding, hence the researcher has chosen the testing citations from those already categorized in the sub-set of 21 codes. The 21 codes cited with high frequency cover 404 citations, taking up 70% of the overall number of data corpus (633 citations).
The first stage of double coding was to test the stability of the qualitative analysis. A test-retest approach, known as an intra-coder agreement test was adopted. The researcher herself reanalysed the 21 codes and their associating 404 citations in this reliability test. The testing resulted in a reliability rating of 87.9%, which is an acceptable agreement rate in an intra-coder agreement test. The test demonstrated the consistency and stability of analysis performed by the same coder.

5.8.5 Assessment of inter-coder reliability

Krippendorff (2004) cautions researchers that using stability as a measure of reliability is the weakest form of reliability, and is insufficient as the sole criterion for accepting data as reliable. Thus, the second stage of double coding invited a second coder to reanalyse a sub-set of data. Based on the coding results yielded from the initial coding round and this second coding round, inter-coder reliability was then calculated and a stronger measure of reliability was reported.

A bilingual PhD student, who is proficient in Mandarin and English, and also familiar with the area of Enterprise Systems was invited to attend the double coding. As the researcher conducted data analysis in the language of Mandarin by which the raw data was collected initially, the double coding required the second coder to also be capable of processing Mandarin textual data. The qualitative analysis is related to comprehending data dealing with the success or impact of enterprise systems; therefore, knowledge of ES and ES evaluation is necessary for the second coder to understand the data and to undertake the double coding.

To reduce the workload of the participating second coder, the inter-coder reliability was conducted on a sub-set of citations of the 404 citations. Lombard, Snyder-Duch et al. (2002) suggests that the appropriate sample size should not be less than 10% of the full data set, to capture variations in a reliability test. Lacy and Riffe (1996) also suggests that a larger size of testing sample should be utilized if the acceptable minimum level of agreement is low (<85%). Considering the inductive and grounded approach of the study, it was decided
that the acceptable agreement rate be no less than 70%. Thus, a considerably large testing sample, namely, a sub-set of 100 citations, was randomly chosen and revisited in the double coding, taking up 15% of the total data set (630 citations), and 25% of the 404 citations pertaining to 21 testing codes.

Prior to the inter-coder reliability test, a supervision team was required to choose a group of 100 citations from the pool of 404 citations randomly. The selected 100 citations were listed in the coding-sheet and the participating coder performed double coding on only this sub-set of citations. The coder needed to cross-reference both citations and the code scheme, mapping the citations into the most relevant codes. Figure 5.6 depicts the process of citation mapping in the double coding.

The set of coding rules are intended to guide the activity of citation mapping in double coding. Three criteria were established to map the citations into the codes. The participating coder was instructed to regularly consider the criteria during the mapping.

- **Mutual exclusivity** is the primary criterion when mapping citations into codes. The citations have been designed to be singular. One citation should be mapped into one code. Multiple mapping is not allowed. When more than one code is considered relevant to a citation, the coder is required to determine the most suitable code to accommodate the citation.

- **Relevance of code:** Citations should be mapped into the most relevant code. If coders encounter difficult citations which are considered irrelevant to any existing codes, they were to record them in as separate table. These unmapped citations were to be reviewed and discussed after the double coding.

- **Constant comparison** is the fundamental to double coding. When coding the citations, the coder should regularly consider the short description of each code, regularly reference the example citations presented, constantly compare the meaning of the citation with the content of codes, and ultimately decide the allocation of the citation.
Comparison of the two rounds of coding reveals an inter-coder agreement of 72%, well in line with the guideline of (Krippendorff 2004), who indicates a minimum agreement rate of 70% as an acceptable measure of reliability. A workshop was set up after double coding. Coders discussed the unmatched citations and codes with significant discrepancies until consensus on the mapping was reached.

No modification was suggested to the codes. Of the 28 missed citations, 24 citations were coded into different codes by the two coders. The second coder suggested that 4 citations were too difficult to map into any of the codes. Coders achieved consensus on the final decisions of the 28 missed citations during the workshop and the agreement on mapping rose to 95%. Eighteen citations remained in the original codes, 5 citations were relocated into other codes, and the rest (5 citations) were decided to be removed from the analysis as they are either too general or too compound to fulfil the analysis goal. The results of double coding and missed citations are attached, in Appendix F.
<table>
<thead>
<tr>
<th>Mandarin citations mapped to the 21 most frequently cited codes</th>
<th>randomly selected citations from (A)</th>
<th>Dimension</th>
<th>Sub-Dimension</th>
<th>Code scheme (of 21 most cited codes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1. SAP can satisfy daily need.</td>
<td>1.1. SAP can satisfy daily need.</td>
<td>Individual Impact</td>
<td>1</td>
<td>Ease to do work</td>
</tr>
<tr>
<td>1.3. Detailed management, facilitate fine management.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5. SAP's use, makes financial work simple and easy. SAP provides a simple way to do daily financial work.</td>
<td>2.5. SAP's use, makes financial work simple and easy. SAP provides a simple way to do daily financial work.</td>
<td>Organization 3</td>
<td>Operation standardization</td>
<td></td>
</tr>
<tr>
<td>2.6. Generally SAP system is good, but sometimes it is not stable. The quality of SAP is generally good but not stable occasionally.</td>
<td></td>
<td></td>
<td>2</td>
<td>Impacts</td>
</tr>
<tr>
<td>3.7. SAP system make our working more convenient.</td>
<td></td>
<td></td>
<td></td>
<td>Enterprise management optimization</td>
</tr>
<tr>
<td>3.11. SAP's use is reliable. SAP system is generally reliable.</td>
<td></td>
<td></td>
<td></td>
<td>Business process optimization</td>
</tr>
<tr>
<td>3.12. Sometimes data transfer is not fast, the transfer process is slow.</td>
<td>3.12. Sometimes data transfer is not fast, the transfer process is slow.</td>
<td>System quality 7</td>
<td>System feature and functions</td>
<td></td>
</tr>
<tr>
<td>3.14. Further, when data from SAP to EW, the data sometimes have problems. Problem always occur when data is transferred from SAP to EW.</td>
<td></td>
<td></td>
<td>3</td>
<td>System quality</td>
</tr>
<tr>
<td>4.15. SAP has already penetrated SOXCO's corporate management,</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Easy to use</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>System reliability</td>
</tr>
<tr>
<td>140, 629 sometimes I feel that we use this system simply because we need to provide data for (financial department deriving financial report).</td>
<td>140, 629 sometimes I feel that we use this system simply because we need to provide data for (financial department deriving financial report).</td>
<td>IS Support quality 21</td>
<td>Computing infrastructure</td>
<td></td>
</tr>
</tbody>
</table>

Count 404 100 6 21
5.9 Strengthening validity of emergent codes

The last section discussed the reliability of the data analysis. The double coding ensures the stability and consistency of the emergent codes and coding process. It is important to point out that until this analysis step, the resultant codes and categories were intermediate and tentative results, because their validity and robustness had not been further justified. Even though the double coding process has tested and indicated the reliability of these intermediate coding results, we cannot make conclusion of their validity. It requires extra effort to justify and strengthen this particular research quality. This section will discuss the validity of the emergent codes and approaches applied to strengthen the quality of validity. Validity refers to study rigour, trustworthiness, authenticity, and credibility (Lincoln and Guba 1985). Both Silverman (2005) and Krippendorff (2004) refer to ‘truths’ when describing validity. (Krippendorff 2004) said ‘validity is the quality of research results that lead us accept them as true (p. 313)’; and Silverman (2005) also subscribes validity as ‘truth’, ‘interpreted as the extent to which an account accurately represents the social phenomena to which it refers (p.149)’.

The study is especially concerned about two criteria of validity of the resultant codes (measures) and categories (dimensions). Firstly, content validity is the issue of most concern: it refers to the extent to which the analysis results can account for a complete content domain of the social phenomenon being studied. This quality has been addressed in previous sections (section 4.5.5 and section 5. 6.10). The detailed descriptive accounts of the coding procedure also demonstrate the endeavour to develop a pool of codes that retain a very broad and relevant study content.

Construct validity is the second criterion the study attempted to address, which relates to the establishment of appropriate operational measures for the social phenomenon being studied. It is often an area of qualitative study criticism, mainly due to potential investigator subjectivity. The overarching problem of investigator subjectivity is the challengeable nature of conclusions reached by
its inferential procedure. Meanwhile, the investigator’s subjectivity also influences the generalizability of the study’s results.

Most texts on construct validation attribute the test and enhancement of construct validity to statistical method and metrics. We contend that, as a qualitative study, we cannot empirically test and improve the construct validity of the concept being investigated in a full capacity as our quantitative peers can, but this study has made efforts to strengthen the construct validity of the study results – the emergent codes and categories.

1. The study set quality criteria based on ‘Analytic Theory’. According to Gregor (2006), Analytic Theory is the most basic type of theory and is necessary for the development of all of the other types of theory. In building a classification model, framework, taxonomy, or a concept analysis study, analytic theory is an important initial step towards building a theory and deriving deeper understanding of a phenomenon of interest. Drawing on descriptions by (Gable, Sedera et al. 2008) of the essential qualities of an Analytic Theory, the researcher decided that several aspects of analytic theory are applicable to the study; these includes completeness, mutual exclusivity, appropriate hierarchy and parsimony. This quality has been discussed in chapter 4 and the four criteria have been employed in the data analysis process presented in Chapter 5.

2. The study employs systematic and standardized research procedure to reduce the investigator subjectivity, and to give the analytical process precision and rigour. This was achieved by a thoughtful research process and by providing sufficient detail about the data collection, data generation and data analysis. The tactic of strengthening the study rigour and validity includes employing classic and mature analysis methods referenced to Grounded Theory and Content Analysis; devising coding protocol and steps to guide the coding activity, utilizing a spreadsheet to record and to track data corpus and codes; documenting the evolving and maintenance of codes and categories;
documenting reflections and thoughts in memos; and acknowledging prior understanding and selected theoretical perspectives to inform the analysis. Chapter 5 has given a very detailed description of the research process in relation to the above aspects.

3. The researcher reflects on the tentative codes and categories constantly, according to the decision rules of (Petter, Straub et al. 2007), to identify formative constructs. Petter, DeLone et al. (2008) caution the IS researcher to properly specify the formative construct, as otherwise the misspecification of formative or reflective constructs will lead to both Type I and Type II errors. Specific to the IS success area, Gable, Sedera et al. (2008) explicate the construct of IS-Impact as a formative construct and emphasize the correspondence of the quality of measurement model to the formative construct. Here, attempting to form a measurement model which ought to manifest a strong quality of formative construct, the researcher constantly judged the goodness of emerged codes and categories against decision rules for formative constructs: 1) direction of causality from construct to measure implied by the conceptual definition; 2) interchangeability of the indicators/items; 3) covariation among the indicators, and 4) nomological net of the construct indicators. It is noted that the first two decision rules are more relevant to the study, as they help researchers to perform construct specification in the conceptualization stage, while the latter two are more related to the statistical realm.

Hence, when deciding on removing, combining, and revising the tentative codes and categories, the researcher constantly considered several questions drawn from the decision rules of (Jarvis, MacKenzie et al. 2003; Petter, Straub et al. 2007): 1) Does the code help to define the characteristics of the high-level category that it is supposed to? 2) Would changes in the codes cause changes in the high-level categories that the codes pertain to? 3) Are any codes interchangeable? 4) Do the codes share the common theme or posit to the same/similar contents? 5)
Would dropping one of the codes alter the conceptual domain of its high-level category that they pertain to?

4. Revisiting prior literature also informs the validity of emergent codes and categories. In this study, a large portion of the literature review was conducted after the establishment of codes/categories. The analysis results point to particular areas of interest which remained unknown in the early stages of the study. For example, the emergent category of ‘User Quality’ points to a literature review on user-related constructs in the IS success and technology acceptance area. The review revealed the fact that studies on user-related constructs are scattered and lack conceptual groundings in these two study areas. The study then explored the user issues in several study area, such as End-User computing, and located a large amount of literature devoted to ‘User Competence’, ‘Self-efficacy’, and ‘Innovativeness’. This body of literature was applied as an additional source of questions and comparisons to clarify and modify the codes/categories. Constantly associating and comparing the emergent codes/categories of ‘User Quality’ to those established or under developed constructs greatly stimulated the researcher’s reflections and theoretical sensitivity to those tentative study results. Based on both the empirical data and the theoretical grounds, the researcher was able to define the category of ‘User Quality and also organize 9 intermediate codes into 3 more consolidated measures which can define the category more legitimately.

These abovementioned approaches resulted in improvements of coding results. A few codes have been expanded, removed and clarified after consulting the literature and constant theoretical reflections. Finally, the data analysis was stabilized as 50 measuring items which were organized into 6 categories. The rationale for the procedure of reduction of intermediate codes is presented in Appendix G. Chapter 6 will report the finalized analysis results. Chapter 7 will provide the interpretations and discussions of the analysis results.
5.10 Conclusions

This chapter builds on Chapter 4 regarding research methodology, which describes a general inductive approach employed in the study. This chapter focuses on a descriptive account of the ‘identification survey’, which is the actual operation of the methodological issues and the application of an inductive investigate approach. The design of the identification survey consists of five research method issues: selection of survey respondents, survey instrument design, empirical data collection, qualitative data analysis and reliability test of qualitative analysis. These detailed descriptive accounts serve as means that independent observers could use to assess this study’s reliability, since the literature indicates that an explicit and detailed description of the process of data processing will enhance the reliability of a qualitative study.
Chapter 6  Research findings – The emergent categories and measures for evaluating ES impacts in China

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6.6 Organizational Impact ............................................................. 226
6.7 User Quality .............................................................................. 236
6.8 IS Support Quality ................................................................. 256
6.1 Chapter introduction

This chapter presents results of the analysis of the identification survey, and discusses findings on the effectiveness of ES in Chinese organizations. The purpose of the identification survey was to ground measures for assessing the effectiveness of ES in the Chinese context. Extensive data on ES impacts and qualities were solicited; 50 measures were identified and organized into 6 categories: ‘System Quality’, ‘Information Quality’, ‘Organizational Impacts’, ‘Individual Impacts’, ‘IS Support Quality’ and ‘User Quality. Those six categories enrich our understanding of phenomena of IS effectiveness/success in a Chinese context and facilitate answers to the research question about how to evaluate the success of Enterprise Systems in Chinese organizations. In this chapter, descriptions of these measures, categorized under the 6 categories, are described in detail. Discussions and comments on each category are also presented.

6.2 Overview of the categories

Figure 6.1 shows the resultant Mandarin version IS-Impact framework at the end of the data analysis. The 144 respondents of the identification survey yielded 630 citations related to the general topic of Enterprise System success or impacts, a mean of 4.4 citations per respondent. The 630 IS-Impact citations were inductively arranged into an organizing system of codes and categories, which correspond to the appropriate measures and dimensions to develop a Mandarin version IS-Impact model. The organizing system consists of 6 dimensions and 50 measures. The 6 dimensions are 1) System Quality, 2) Information Quality, 3) Organizational Impacts, 4) Individual Impacts, 5) User Quality and 6) IS Support Quality.

Table 6.1 shows that the 50 measures consist of 13 System Quality, 6 Information Quality, 12 Organizational Impacts, 7 Individual Impact, 3 User Quality and 9 measures of IS Support Quality. Table 6.1 also depicts the instantiation of each dimension. Specifically, 206 citations (32.7%) are mapped
into the dimension of ‘System Quality’; 39 (6.2%) citations are mapped into
the dimension of ‘Information Quality’; 156 (24.8%) pertain to the dimension
of ‘Organizational Impacts; 138 (21.9%) pertain to the dimension of
‘Individual Impacts’; 42 (6.7%) citations were coded into the dimension of
‘User Quality’, and 49 (7.7%) were coded into the dimension of ‘IS Support
Quality’.

<table>
<thead>
<tr>
<th>Categories</th>
<th>Measuring Items</th>
<th>Citations (counts)</th>
<th>Citations (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Quality</td>
<td>13</td>
<td>206</td>
<td>32.7%</td>
</tr>
<tr>
<td>Information Quality</td>
<td>6</td>
<td>39</td>
<td>6.2%</td>
</tr>
<tr>
<td>Organizational Impacts</td>
<td>12</td>
<td>156</td>
<td>24.8%</td>
</tr>
<tr>
<td>Individual Impacts</td>
<td>7</td>
<td>138</td>
<td>21.9%</td>
</tr>
<tr>
<td>User Quality</td>
<td>3</td>
<td>42</td>
<td>6.7%</td>
</tr>
<tr>
<td>IS Support Quality</td>
<td>9</td>
<td>49</td>
<td>7.7%</td>
</tr>
<tr>
<td>TATOL</td>
<td>50</td>
<td>630</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 6.1 The instantiation of categories
### System Quality

The dimension of ‘System Quality’ relates to the performance of the Enterprise System from a technical and design perspective. This dimension describes the desirable characteristics of an Enterprise system from the perspective of the Chinese end-users. System quality is an integral component of IS-Impact models. Prominent system features can be conceived of as best predictors of future net benefit from the ES. Looking backward, we conceive that the realized benefits from an ES are based on the good quality of the ES. Similarly, looking forward, conceptually we can anticipate that a high-quality system would yield more benefits in the future. In this study, 13 ES features are identified, and they are largely related to three aspects of an ES technical and design quality: (1) system performance – necessary quality attributes that an ES should have, (2) system usability – the system should be user-friendly and easy
for hands-on, and (3) system localization – the system is well contextualized for the local market and compatible with the specific business scenario.

Table 6.2 depicts the 13 measures identified through the Identification survey. The measures were listed from the most frequently cited to the least. Note that none of these factors are binary, where either you ‘have it’ or you ‘do not’. Rather, they are characteristics that organizations seek to maximize in their ES to optimize its quality. Therefore, the expression in relation to the short description of each measure was phrased as ‘the degree to which it does’.

<table>
<thead>
<tr>
<th>No.</th>
<th>Measures</th>
<th>citations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SQ-1</td>
<td>System functionality</td>
<td>42</td>
<td>the completeness of features and functions provided by current version of SAP system</td>
</tr>
<tr>
<td>SQ-2</td>
<td>Ease of use</td>
<td>31</td>
<td>the ease with which users can employ the ES to perform a particular task</td>
</tr>
<tr>
<td>SQ-3</td>
<td>System reliability</td>
<td>29</td>
<td>the extent to which the system runs stable and always up-and-running necessarily</td>
</tr>
<tr>
<td></td>
<td>System Integration</td>
<td>26</td>
<td>the ability of ES to communicate/transmit data between systems or modules servicing different functional areas</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>module integration</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>system synchronization</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Powerful Database</td>
</tr>
<tr>
<td>SQ-4</td>
<td>System response time</td>
<td>22</td>
<td>to the degree to which the SAP system responds quickly upon their request</td>
</tr>
<tr>
<td></td>
<td>System configuration</td>
<td>21</td>
<td>the extent to which the system provides a number of configuration options as well as the system was configured to suit the adopter’s practice.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Misfit between the software configuration and current business setting;</td>
</tr>
<tr>
<td>SQ</td>
<td>System Quality</td>
<td>Measure</td>
<td>Description</td>
</tr>
<tr>
<td>----</td>
<td>-----------------</td>
<td>--------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>SQ-7</td>
<td>System sophistication</td>
<td>11</td>
<td>Lack of parameters, descriptions and options; Lack of flexibility to adjust to user’s new conditions and needs.</td>
</tr>
<tr>
<td>SQ-8</td>
<td>System Extendibility</td>
<td>9</td>
<td>the elegance and clarity of a system design with which the interaction with the system is more efficient. In the scenario of Packaged ES, the item refers to a user-friendly ES that requires only the minimum number of fields and screens to achieve a task user-friendly interface simple and concise system operation</td>
</tr>
<tr>
<td>SQ-9</td>
<td>System accuracy</td>
<td>7</td>
<td>the capacity of expansion or extension to meet the new requirement, conditions, and circumstance of the users and their organization</td>
</tr>
<tr>
<td>SQ-10</td>
<td>Ease of learning</td>
<td>5</td>
<td>the degree of congruency between what the user wants or requires and what is provided by the ES</td>
</tr>
<tr>
<td>SQ-11</td>
<td>System security</td>
<td>1</td>
<td>the extent to which the operations can be learned by user observing the system</td>
</tr>
<tr>
<td>SQ-12</td>
<td>System translation</td>
<td>1</td>
<td>the safe guarding of data from misappropriation or unauthorized alteration or loss</td>
</tr>
<tr>
<td>SQ-13</td>
<td>Powerful database</td>
<td>1</td>
<td>localizing an ES with appropriate local language when the ES was introduced to users in overseas</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>206</td>
<td>Integrated database</td>
</tr>
</tbody>
</table>

Table 6.2 The measures of System Quality
6.3.1 Description of System Quality

According to the Identification survey, a large number of Chinese operational users, including the operational management and staff, might value a Packaged ES from several aspects: 1) sufficient features and functions, 2) ease of use, 3) system reliability, 4) system response speed, 5) ability to re-configure, and 6) system integration. These 6 items take up 86.6% of the citations which were coded into this dimension.

System features describes the extent to which the ES provides useful features to meet users’ requirements. Users have expectations of ES. The expectations are the set of attributes or features of the computer-based information products or services that a user considers reasonable from the computer-based information support rendered within his organization (Bailey and Pearson 1983). According to the identification survey, the sample respondents emphasized heavily the completeness of features and services provided by the current version of the SAP system. Of the 40 citations related to system features, only a few statements praise the ‘powerfulness’ of the system in terms of the sufficiency of system features. A number of respondents commented that basic requirements were satisfied currently but it was necessary to make further improvements to the functionality of the system. Additionally, some respondents pointed to specific areas they expected to be realized or improved in the future.

Ease of use describes the extent to which the Enterprise System is easy to operate. This attribute denotes the ease with which the user can employ the ES to perform a particular task. Thirty-one citations were found to comment on this attribute. Most respondents felt the SAP system is ‘easy to use’ or ‘straightforward to operate’, while a few consider the system is ‘difficult/complicated/inflexible’ to use.

System reliability describes the stability of the ES. This attribute depicts the extent to which the system runs stably and is necessarily always up-and-running. Of the 29 citations, most respondents were satisfied with the
reliability of the SAP system. A few respondents reported their experience with occasional system instability, such as process outage.

System Integration describes the ability of ES to communicate/transmit data between systems or modules servicing different functional area. Integration is an important characteristic of contemporary ES. Nowadays, the enterprise-based packages contain a set of packaged application software modules, with an integrated architecture, and become the primary engine for integrating data, processes and information technology across internal and external value chains (Davenport 1998). System integration is a complex concept with multi-facets, consisting of network integration, data integration, application integration and process integration (Giachetti 2004). In line with the complexity of system integration, the identification survey inventoried a variety of citations pertaining to varying issues in relation to this measure.

Among the 26 relevant citations that were found in the survey, 2 types of integration were discussed: 1) technical integration – the degree to which the SAP system is designed and configured integrally, 2) data integration – the extent to which the data in the system is fully integrated and consistent. In relation to the technical integration, respondents commented on the system’s robust architecture, powerful database and integration of modules. Furthermore, regarding data integration, respondents emphasized consistent and synchronized data across modules and functionalities.

System response time depicts the elapsed time between a user-initiated request for service or action and a reply to that request (Bailey and Pearson 1983). In this survey, the respondents generally refer to the degree to which the SAP system responds quickly upon their request. Of the 22 citations, a large number reveal dissatisfaction with the response speed of the current system. Respondents complained about a very slow system when requesting and transferring a large amount of data. Also, respondents reported a decreased system response time compared to years before when the SAP was launched in PETRO.
**System configuration** refers to a distinct attribute and ability of ES. Packaged ES is a semi-finished product with tables and parameters that user organizations must configure to their business needs (Shang and Seddon 2002). This measure describes the extent to which the system provides a number of configuration options as well as the extent to which the system was configured to suit the adopter’s practice. Of the 22 citations related to this measure, a number reported misfits between the current SAP system and PETRO’s practical business processes. Respondents commented that ‘the system is far different from our practical operations (No. 33.126), and ‘when the business scenario embedded in software did not suit to our work setting, we have to compromise to the software and to made human adaptation during our work (No.38.151)’. Other respondents commented on the inappropriate system configuration, such as ‘defective template of report’ and ‘redundant or insufficient parameters in a business scenario’. Due to the deficiency and misfits caused by system configuration, a number of respondents felt a medium to low level of flexibility of the system.

Besides the above 6 attributes of packaged ES, a few respondents were also aware of 5 quality items, including 7) System sophistication 8) System Extendibility, 9) System accuracy, and 10) Ease to learn. Though the appearances of these 5 items are not as frequent as the top 6 items, they are also worthwhile investigating.

**System sophistication** generally refers to the elegance and clarity of a system design with which the users’ interaction with the system is more efficient. In the scenario of Packaged ES, the item refers to a user-friendly ES requiring only the minimum number of fields and screens to achieve a task (Gable, Sedera et al. 2008). Six relevant citations were found in the survey. Some respondents suggested dissatisfaction with the user experience because of ‘the redundant entry and going through excessive screens to achieve a simple task (88.328)’. Others praised the ‘user friendly interface’ of the SAP system.

**System Extendibility** depicts the capacity of expansion or extension to meet the new requirements, conditions, and circumstance of the users and their
organization. Respondents commented that the fast and frequent changes of the internal and external business environment posed great challenge to their enterprise system. It requires an extendable system in response to the company’s growth and expansion as well as a dynamic marketing change.

**System accuracy** refers to the degree of congruency between what the user wants or requires and what is provided by the ES. In other words, the ES always does what it should (Gable, Sedera et al. 2008). Seven relevant citations pertaining to the issue was identified in the identification survey.

**Ease of learning** depicts the extent to which the operations can be learned by the user observing the system. Of 5 citations pertaining to the measure, contradictory perceptions were found in terms of the ease to learn SAP systems.

Among the 13 measures, 3 items occurred only once in the survey. They are 11) system security, 12) system translation and 13) useful error message. Given their uniquely contextual meaning and the importance emphasized by the previous study, these two items remain in the list. **System security** refers to the safeguarding of data from misappropriation or unauthorized alteration or loss (Bailey and Pearson 1983). **System translation** denotes localizing an ES with appropriate local language when the ES was introduced to users overseas. Finally, the item of **database** refers that no important data is missing in the integrated database.

### 6.3.2 Observations of System Quality of packaged ES

Four comments have been made on the dimension of System Quality.

**Observation 1: Rule of thumb: the system is technically sound**

The first issue of note is that intrinsic quality attributes of the information system are highly valued by Chinese end-users. The Identification survey indicated that Chinese users emphasize quality factors in terms of useful features, reliability, response times, accuracy, and security. Although these technical design features have been discussed for decades (Bailey and Pearson 1983; DeLone and McLean 1992; Gable, Sedera et al. 2008) from the age of
Mainstream systems, a system being technically sound is still essential to the adopter organizations and end-users of contemporary IS. Those quality items are basic yet critical features from the perspective of Chinese users, and an ES of good quality might promise positive impacts to Chinese organizations.

**Observation 2: More quality attributes of contemporary ES were emphasized by Chinese end-users**

This dimension of System Quality is also instantiated with quality attributes of contemporary ES. Enterprise Systems are distinguished from in-house developed IS in a number of aspects. The items of system configuration, integration and extendibility respond to these distinct quality features of ES. Firstly, ES are mass customized products (Shang and Seddon 2002). These off-the-shelf software application packages are designed with pre-packed options that enable users to customize systems to meet specific business need and to prototype the results directly. A variety of configuration alternatives are offered for the user. In the study, respondents acknowledge the significance of the configuration features of ES. They learned that the configuration and re-configuring the system can be done as new requests and conditions emerge. However, respondents’ negative comments on occurring misfits between the system configuration and their work setting were also meaningful. It implied that configurability can also be a challenge for organizations to learn and to configure the complex system properly according to their business needs (Shang and Seddon 2002).

Technical Integration is another distinct feature of ES. Based on the standard process architecture, Packaged ES, especially the large-scope ES applications, are designed as a composition of modules. These modules can be purchased separately, and more modules can be added to the initial purchased modules later. This robust but flexible architecture offers scalability of the system. The identification survey indicated Chinese users’ awareness of the advanced technical feature with regard to the integrated process, database and architecture.
System integration is also presented as integrated data from the system. Data integration refers to sharing the data between multiple applications, organization units and resources. Data integration relies on ‘data schema integration’ which means data defined in the unified structure, syntax, and semantics (Giachetti 2004). In this sense, data distributed in different applications, organizations and resources can speak the same language. Regarding contemporary ES, because the system is normally built on a shared database with a unified data schema, the data integration is theoretically realized in this context.

System extendibility is instantiated empirically in the survey as well. Shang & Seddon (2002) argue that the extendible ES provides organizations with an application infrastructure for various organizational innovations. Implementation of an ES actually is implementing an extendible and expandable IS infrastructure, facilitating organizations to update their business process or make expansion into new business areas that the in-house legacy system is difficult to support. Respondents in the I-survey were aware of system extendibility as a unique system feature providing strategic competitiveness. A number of respondents were looking forward to a constantly evolving SAP system in order to support their new internal and external environments.

**Observation 3: End-users request for ES of good usability**

It is observed that this sample of respondents value an ES of good usability. A few measures pertaining to the system usability design were identified from the I-survey, including ease of use, ease of learning and system sophistication. System usability broadly encompasses those factors that affect how easily a user can use a system, or how user friendly it seems from the end-users’ perspective (Fisher 1999). Usability refers to how people work with the product. Usability means that the people who use the product can do so quickly and easily to accomplish their own tasks (Dumas & Redish, 1994).

Lin, Smith et al. (2005) argue that system usability should address the question ‘how easily can users do his/her job when he/she use the system’. Meanwhile,
system usability includes 9 dimensions: 1) ease of learning, 2) ease of use, 3) task orientation, 4) self-descriptiveness, 5) predictability, 6) fault tolerance, 7) flexibility, 8) user control, and 9) friendliness. Opposing dimensions of system usability, typical design problems pertaining to ‘usability’ often include inconsistencies in system interfaces, poor error messages, the inability to reverse incorrect actions, and too many commands/options/inputs.

In the I-survey, similar negative comments have been reported by respondents. For instance, respondents complained that poor error messages prevent them from recognizing, diagnosing, and recovering from errors:

‘Some error message is so simple. They do not contain any useful information, such as an indication of the problem and a solution suggested fixing the problem. Therefore, users are not able to deal with basic problems in the light of the error message (No. 69.272).’

Another example of the usability is dissatisfaction with the system sophistication. Respondents complained about the inefficiency in using the SAP system: it takes users too much time, needs too many commands, goes through too many screens and manual inputs to accomplish a task:

‘Some operations should be simplified, for example, rather than manual inputting running numbers one by one, it would be much easier if running number assigned automatically during splitting VLSP (No. 51.192).’

Those measures related to usability also implied that the technical design of IS should address human factors. In other words, IS should be designed for the end users. In the design effort, the needs and interests of the end user should be addressed, and the system should be developed in accordance with a generalized user’s psychology and physiology. Lin et al. (2005) argue that ‘human factors in systems and the issue of “user friendliness” or “usability” have been recognized in the recent past as a key determinant of system success (p29).’ A technically sound system does not mean that it will be easy to learn and use. A technically sound but poorly designed system with regard to usability will reduce the productivity of end users and also add difficulties in training new staff.
Observation 4: ES needs to fit in with the adopter’s context/localization

Enterprise Systems, especially the large-scope Enterprise Systems, are contemporary technology inventions which embed the beliefs and business practices of industrialized western countries. The localization has twofold meanings conceived by the local user. First of all, it is necessary for this enterprise system to be translated into the national language and modified to conventional practice (for example, the accounting scheme and regulation) when it comes to the local market. A problematic translated system (1) will impede effective usage of the system. Secondly, Chinese organizations need to customize this off-the-shelf software product to their specific context before putting the system into use. The underlying belief and practice of the system should be re-configured (21) in order to fit the actual needs of the Chinese adopter. Additionally, the fast and frequent changes of the internal and external business environment also pose great challenges to an Enterprise System. It requires an extendable system (9) supporting internal growth and expansion as well as an external marketing change.

6.4 Information Quality

The dimension of ‘Information Quality’ relates to the quality of the system output, namely, the quality of the information that the system produces in reports and on-screen (DeLone and McLean 1992; Gable, Sedera et al. 2008). Sedera (2005) argue that the measures pertaining to Information Quality should also address the value, usefulness, or relative importance attributed to it by the user. In other words, the design of the system output should also address ‘human factors’. Results from reviews of previous studies on IS evaluation/success/effectiveness emphasize the importance of the quality of information/outputs produced by IS. Information that is useful, timely, accurate, and presented in a meaningful manner is always the goal of a good information system.

Results of the identification survey also suggest the importance of the quality of information in the context of ES in Chinese organizations. Six emerged
measures (codes) pertaining to the dimension of Information Quality address the desirable characteristics of outputs produced by an Enterprise system from the perspectives of the Chinese end-users. Table 6.3 depicts the 6 measures identified through the Identification survey. The measures are listed from the most frequently cited to the least.

<table>
<thead>
<tr>
<th>No.</th>
<th>Measures</th>
<th>citations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ-1</td>
<td>information availability</td>
<td>17</td>
<td>the extent to which the information from the system was complete and comprehensive</td>
</tr>
<tr>
<td>IQ-2</td>
<td>information timeliness</td>
<td>5</td>
<td>the availability of the output information at a time suitable for its use</td>
</tr>
<tr>
<td>IQ-3</td>
<td>Report usefulness</td>
<td>5</td>
<td>The extent to which the content of the report are useful, relevant and innovative to users and fulfill user’s task.</td>
</tr>
<tr>
<td>IQ-4</td>
<td>Report usability</td>
<td>4</td>
<td>the report can be put into use directly</td>
</tr>
<tr>
<td>IQ-5</td>
<td>Report format</td>
<td>4</td>
<td>The extent to which the presentation of reports is readable, clear and well-formatted.</td>
</tr>
<tr>
<td>IQ-6</td>
<td>Information trustworthiness</td>
<td>4</td>
<td>the extent to which information is trusted or highly regarded in terms of their source or content</td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>39</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.3 The measures of Information Quality

6.4.1 Description of measures of Information Quality

Chinese users are aware that the reports of good quality yielded by ES are essential here. They commented on the good **format of reports** and **usefulness of the reports**. They also noted the **usability of reports**.

**Report usefulness** is a concern about the content of SAP reports, namely, the extent to which the contents are useful, relevant and innovative to users and fulfill the user’s task. A few citations commented on this issue, revealing that the content of some reports needs to be enhanced. However, respondents were
also aware that the utility of a report is dependent on the system design: ‘since some features, tables, or modules were designed or configured improperly, a number of fields cannot be filled or used, and then input data sometimes are insufficient and useless. This subsequently resulted in the fact that many analysis and reports derived from SAP is useless or not worthy for formal usage (No. 88.331).’

**Report format** refers to the presentation of the report. Bailey and Pearson (1983) define ‘format of output’ as the material design of layout and display of the output content. Gable, Sedera et al. (2008) suggests that this item measures the extent to which the report is readable, clear and well formatted. Of the 4 citations denoting the measure, respondents commented that the SAP delivered report would benefit from an improvement in the format.

**Report usability** denotes whether the report can be put into use directly. Similar to system usability, the output of a system also needs to address ‘ease of use’ and ‘user-friendliness’ issues. Specifically to the I-survey, a few respondents identified some SAP reports as being in a form that was not readily usable. As one respondent commented ‘the report yielded by SAP is not ready to use immediately. We have to process them in Excel again (No.49.186)’.

Besides concerns about reports produced by the ES, the sample respondents also convey concerns about the general quality of the information output of the system. Three quality attributes of information quality were identified in the survey: information availability, timeliness and trustworthy.

**Information availability** refers to the extent to which the information from the system was complete and comprehensive. Of the 17 citations related to the issue, most comments praised the fact that the SAP system contributes to the enhancement of comprehensiveness of data: ‘It save more historical data in a long period (No. 57.587)’, or ‘complete data from SAP provide the data base for a depth analysis (No. 71.605)’.

**Information timeliness** was defined as ‘the availability of the output information at a time suitable for its use (Bailey and Pearson 1983). It is a conventional measure appearing in seminal papers in terms of evaluating IS
success (DeLone and McLean 1992; Gable, Sedera et al. 2008), user sanitation (Bailey and Pearson 1983), and data quality (Wang and Strong 1996). The identification survey also suggested that timeliness of information is an important attribute of information valued by Chinese ES users.

**Information trustworthiness** refers to the extent to which information is trusted or highly regarded in terms of its source or content. The shared database and data schema eliminate the problem of data inconsistency. Meanwhile, the encoded rules of information authorization and control reduce human intervention and tampering with data. Similar measures presented in an extant IS evaluation study are data reliability/ precision/accuracy. Four citations were found related to this measure. Respondents commented that information from SAP is trustable, because ‘those records were kept faithfully and completely since they were generated (No.57.205).’

### 6.4.2 Observations made on Information Quality of ES

**Observation 1: three relevant measures pertaining to reports produced by ES**

The results of the I-survey indicate 3 critical issues of good quality reports, namely, content, format and usability of reports. According to the study, respondents reported a number of issues and problem about the quality of reports produced by SAP occurring in their daily work. They found the report’s content is not always so useful, the report’s format needs to be improved, and the report’s usability is disappointing as well. Although the SAP system is designed and embedded with many standard report functions, it seems that Chinese users are not satisfied with them.

The data from the I-survey did not provide explanations for the disappointments of Chinese users, but the context research, through an intensive review of literature on enterprise system adoption and utilization, sheds some lights on the issue. The results of the literature review reveal an output/interface misfit between the technical design of the ES package and the Chinese organizations’ business needs (Soh, Kien et al. 2000; Hong and Kim 2002). Compared to western countries, China operates different systems of
policy and regulations in terms of accounting, taxation, and importing/exporting process (Zhao and Grimshaw 1992). This unique regulation system means that Chinese organizations have to choose an ES which is compatible with these national regulatory norms and standards (Xue, Liang et al. 2005; Trombly 2006; Ge and Voss 2009) and produce reports in accordance with the imposed national standard. Evidence shows that international ES products did not completely localize their interface, output content, and report format according to the local practice, and this type of misfit has become a critical barrier frustrating international ERP vendors who explore China’s ES markets (Liang, Xue et al. 2004). The empirical data from the Identification survey mirror the findings from the literature, highlighting the importance of measuring report quality from those emerged measures: format, content and usability of system produced reports.

Observation 2: Improved information quality through the implementation and utilization of ES

The Identification survey implies that ES adoption and implementation contribute to an overall enhancement of information quality in Chinese organizations. The literature indicates that data format and content accuracy have been singled out as critical issues in the context (Shanks, Parr et al. 2000; Brown and He 2007; Zhang, Cecez-Kecmanovic et al. 2008). Due to poor information quality, readiness of the data for the ES system is a problem in Chinese organizations (Brown and He 2007). Shanks et al. (2000) noted that Chinese organizations often take longer time for ES implementation projects, compared to companies in Australia. Because the legacy data were of rather poor quality in the Chinese firm, it incurred extra time for data-sorting before transferring data to the new ES system. Accompanying the implementation of enterprise systems, Chinese organizations have to clean up archival and historical data, implement a shared data schema, and integrate a distributed data source across organizations. In this case, the implementation of enterprise systems provides Chinese organizations with an opportunity to enhance the quality of data. Corresponding to this scholar’s argument, the empirical data yielded in the I-survey confirmed the enhancement of information quality,
reflecting as improved data availability, timeliness, reliability and integration. Those quality attributes were transformed into useful measures to benchmark information quality across time, functions and applications.

6.5 Individual Impact

Previous studies indicate that the impact resulting from IS is difficult to define in a non-ambiguous fashion (DeLone and McLean 1992; DeLone and McLean 2003). When it comes to the era of Enterprise Systems, the complexity and large-scope of high-end IS add more difficulties in defining and measuring the yielded impacts. DeLone & McLean (2003) use a high-level construct, Net Benefits, describing the overall benefits produced by contemporary IS in their 10 years update of the IS success model. They argue that ‘the impact of IS has evolved beyond the immediate user…there is a continuum of ever-increasing entities, from individuals to national economic accounts, which could be affected by IS activity (p.19)’. However, a high-level construct may add to the succinctness of presentation of a model, but will not assist in any further understanding of the IS measurement issue. Therefore, this study looked into a set of specific dimensions and measures addressing success and impacts of packaged ES in the context of Chinese organizations. DeLone & McLean (2003) also remind researchers that the choice of where the impacts should be measured will depend on the system or systems being evaluated and their purposes. Hence, we delineate the scope of investigation as impacts on the business, management and organizational activities within the boundary of the organization, but no scope is set for the level of investigation, namely, the study survey for any impacts on individuals, work groups and organizations. The research findings resulting from the I-survey indicate two categories of impacts produced by ES, including ‘Individual Impact’ and ‘Organization Impact’. This section will give an account of the category of impacts on individuals.

The dimension of ‘Individual impact’ is closely related to ‘individual performance’ (DeLone and McLean 1992), namely, a measure of the extent to
which the ES has influenced the capability and effectiveness of individual employees, in the context of organizations (Gable, Sedera et al. 2008). This dimension focuses on the relevant impacts on the immediate users of ES.

Results of the identification survey indicate 7 measures pertaining to the dimension, including 1) easy to do work, 2) improve individual productivity, 3) operation standardization, 4) improved working accuracy, 5) information retrieval and awareness, 6) workload change, and 7) individual learning. Seven measures were instantiated with 138 citations, 22% of the total amount of the data corpus. Table 6.4 depicts the 7 measures identified through the Identification survey.

<table>
<thead>
<tr>
<th>No.</th>
<th>Measures</th>
<th>Citations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>II-1</td>
<td>Easy to do work</td>
<td>72</td>
<td>the extent to which the system make the individual’s job easier</td>
</tr>
<tr>
<td>II-2</td>
<td>Improved individual productivity</td>
<td>27</td>
<td>the enhancement of productivity in performing a task; specifically, refers to speeding up the completion of an individual’s work.</td>
</tr>
<tr>
<td>II-3</td>
<td>Operation standardization</td>
<td>12</td>
<td>the extent to which the enterprise systems assist in standardizing and simplifying individual employees’ work process or workflow</td>
</tr>
<tr>
<td>II-4</td>
<td>Improved working accuracy</td>
<td>9</td>
<td>a better-off outcome of individual work because of the involvement with the ES, namely, the precision and correctness of the working outcome</td>
</tr>
<tr>
<td>II-5</td>
<td>Information retrieval and awareness</td>
<td>9</td>
<td>A better-off awareness, retrieval and recall of job related information</td>
</tr>
<tr>
<td>II-6</td>
<td>Increase work intensity</td>
<td>5</td>
<td>the extent to which the adoption of ES resulted in a more intense workload for individual employees</td>
</tr>
<tr>
<td>II-7</td>
<td>Individual Learning</td>
<td>4</td>
<td>the organizational learning enacted by Enterprise system</td>
</tr>
</tbody>
</table>
6.5.1 Description of measures of Individual Impact

According to the sample of Chinese ES users, one of the essential impacts of ES is improved individual task performance, and 115 citations are concerned about this benefit. It is noted that a great number of users consider ES makes their job much easier (72); for instance, they can make daily data queries easily and conveniently. ES also benefits individual users in light of standard workflow (12). They can perform tasks in a systematic way that is repeatable and easy to follow. Meanwhile, enhanced personal productivity is also demonstrated by improved working accuracy (9), increased workload (5) and better information retrieval and awareness (9). Another evidence of this outstanding impact is that 27 users conclude their response as ‘SAP improves my working efficiency (27)’. Moreover, some users also give praise that ES provide them with great learning opportunities (2).

Easy to do work refers to the extent to which the system makes an individual’s job easier. It is noted that a majority of citations (60%) pertaining to the dimension of Individual Impacts reflected the theme of ‘making job easier’. A large number of respondents, across 5 different business functionalities and ranging from varying employment levels, praised the fact that the SAP system ‘brought convenience to their job’ and ‘facilitate effectiveness in their task performance’. Of the 72 citations, the most frequently quoted impact is ‘the convenience to make data query in the system’.

Individual productivity depicted the enhancement of productivity in performing a task. It is noted that ‘Enhancement of productivity’ is an ‘in vivo code’ identified from the survey, where a number of respondents (25 of 27 citations) used this statement to describe positive outcomes resulting from using the SAP system intuitively. Specifically, a few respondents specified the
enhancement of productivity as ‘speeding up the completion of a particular task’.

**Operation standardization** refers to the extent to which the enterprise systems assist in standardizing and simplifying individual employees’ work processes or workflow. Enterprise Systems, such as the SAP system, claim to embed with ‘best practice’ process architecture that impounds deep knowledge of business practice accumulated from the vendor’s years of experiences and implementations in a wide range of client organizations. Nowadays, many off-the-shelf ES are tailored for a particular industry and provide industry specific solutions which inscribe standard business process fit to the general needs of a cluster of organizations within an industry. Therefore, assuming a low level of system customization is required and BPR is being implemented, adoption of these packaged ES is to adopt a pre-defined and standardized workflow as well as a performance metric for each activity in the overall operational process. In this circumstance, an individual employee’s job has been re-defined and standardized, as their individual work role and task constitute the whole standard operational processes and business value chain. According to the survey, 12 citations pertaining to the category indicate that the SAP system benefits most employees in terms of improved clarity and standardization of job role and work task.

**Improved working accuracy** depicts a better-off outcome of individual work because of the involvement with the ES, namely, the precision and correctness of the working outcome. Seven citations identified in the survey relate to this measure. For example, respondents in the department of finance suggested that ‘a more accurate analysis and summary were able to be executed (No. 36.143)’. Meanwhile, respondents from the production function also suggested that ‘we realized targeted tracking customers and their consumption of our products (No.65.238)’.

**Information retrieval and recall** depict another better-off outcome of individual work due to the involvement with ES. This improved outcome is concerned with the awareness, retrieval and recall of job-related information. It
is noted that this particular measure presents in a number of seminal studies on
IS evaluation (DeLone and McLean 1992), suggesting a universal impact
produced by many types of IS. Specific to this I-survey, this measure was
instantiated with the characteristics of the Enterprise System, especially that of
the ERP system (SAP R/3). ERP virtually focuses on enterprise transactions
processing (Kearney 2010). Without the ERP system, today’s corporations
might not handle such a tremendous volume of transactions and information,
and today’s routine business processes might not be possible. ERP systems,
such as SAP, render users an effective tool to manage, retrieval and recall
transactional information, as they offer powerful functions to do data query and
a user-friendly interface to do data presentation. Specific to the I-survey, 9
citations depict that the SAP system is beneficial to the effectiveness of
transaction recall and retrieval.

**Increased work intensity** refers to the extent to which the adoption of ES
resulted in a more intense workload for individual employees. The I-survey
reported some observations on the workload change accompanying the
utilization of SAP system.

**Individual learning** refers to the organizational learning enacted by the
Enterprise system. Gable, Sedera et al. (2008) suggest that the advent of ES has
resulted in much learning about the organization through the system. Of 4
respondents who commented on learning through SAP system, 2 respondents
are IT professionals. They contend that they have learned much about
functional knowledge and business process through their interaction with the
SAP. The other 2 respondents whose jobs involves multiple SAP modules
suggested that they were obliged to learn some necessary financial knowledge
and gained a better understanding of the corporation’s financial processes,
because the implementation of SAP required a closer cooperation between their
business functions and financials.

### 6.5.2 Observation made to Individual Impacts

The results of the I-survey indicate several system impacts closely related to
the immediate system users. It is also noted that the enterprise system influence
on individual user’s job processes or job outcomes is significant. Of the 7 measures, 2 measures emphasize how the ES was beneficial to facilitating a better job process. Firstly, ‘Easy to do work’ suggested that users can approach the work in an easy, convenient way as the system provides them with useful and usable features, functions and interface, aiding in smooth and effective transactional processing in their daily work. Secondly, ‘operational standardization’ depicts another benefit of the SAP system in relation to the individual’s job processes. The well-defined, standard workflow which is pre-paced in SAP virtually clarifies and standardizes the procedure for accomplishing a task. Furthermore, the clear and easier job processes enable better-off job outcomes. This survey addresses four types of improved outcome, consisting of improved job productivity, job accuracy, job awareness and job intensity. Changes in one of the indicators reflect distinct consequence caused by utilization of ES. It is noted that those four indicators conform to the description of formative indicators given by Petter, Straub et al. (2007). These four indicators pertain to distinct characteristics of individual job outcomes. They might not happen at the same time to the same individual user but they are not interchangeable.

6.6 Organizational Impact

Researchers are keen to measure the benefit of IS from an organizational point of view. Though it is widely acknowledged that ES (and general IS investment) result in considerable intangible impacts in addition to more tangible impacts, a common tendency in evaluating the payoff of ES is to employ financial criteria for gauging both intangible and tangible impacts. Previous studies indicate that reliance on financial measures is not without problem, and in many cases, quantifying intangible IS benefits is not effective either. Though ES investments are in many ways comparable to traditional investment, they entail a set of complementary organizational elements to yield impacts and values. It is very difficult to isolate the organizational impact of ES from other organizational factors influencing organizational performance. Furthermore, it
is also difficult to use traditional financial criteria alone as evidence addressing if the ES investment is worthwhile.

It is noted that this study attempts to evaluate the effectiveness of ES rather than the value of ES investment. There is another academic stream dedicated to this latter area, known as IT value, which emphasizes employing quantifiable financial indexes such as ROI, market share, productivity analysis, customer satisfaction, and profitability to assess the value of technology investment.

Hence, in evaluating the goodness of the system from an organizational point of view, the study set forth to investigate subjective measures, such as organizational cost-effectiveness, overall productivity, communication and coordination of functionalities, and business process change. Prior study suggested that, to assess the success of ES, not all people who are invited to evaluate organizational benefits of an IS are in a position to assess the improved profitability due to the system (Petter, DeLone et al. 2008), or the subjective measures deemed more applicable than financial indicators, since they make sense to a wider range of evaluators.

The dimension of ‘Organizational Impact’ that emerged in the survey is a subjective measure closely related to ‘organizational performance’ (DeLone and McLean 1992), namely, a measure of the extent to which the ES has promoted improvement in organizational results and capabilities (Gable, Sedera et al. 2008). Table 6.5 describes the 12 items identified through the Identification survey.

<table>
<thead>
<tr>
<th>No.</th>
<th>Measures</th>
<th>citations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OI-1</td>
<td>Information transparency</td>
<td>31</td>
<td>this item is a more authorization specific item, emphasizing the ease or difficulty with which the user who needs the information is able to get access to the information</td>
</tr>
<tr>
<td>OI-2</td>
<td>Enterprise management optimization</td>
<td>21</td>
<td>the extent to which the adoption of ES contribute precision and structure in the</td>
</tr>
<tr>
<td>OI-3</td>
<td>Business process optimization</td>
<td>20</td>
<td>The extent to which the ES crystallize and redefine their previous business process, then facilitate a more accountable, standardized, transparent business process.</td>
</tr>
<tr>
<td>OI-4</td>
<td>Enterprise integration/cooperation</td>
<td>19</td>
<td>Corporation’s functionalities were streamlined and coordinated as an integrated entity, sharing mutual vision and moving toward common strategic goals.</td>
</tr>
<tr>
<td>OI-5</td>
<td>Improved outcome/output</td>
<td>17</td>
<td>The extent to which the ES result in better outcomes and outputs to fulfill internal or external customers’ requirements.</td>
</tr>
<tr>
<td>OI-6</td>
<td>Improved overall productivity</td>
<td>17</td>
<td>The extent to which the ES resulted in improved business efficiency and effectiveness.</td>
</tr>
<tr>
<td>OI-7</td>
<td>Business control</td>
<td>9</td>
<td>The extent to which the ES facilitate stronger management control and reduce possible risks.</td>
</tr>
<tr>
<td>OI-8</td>
<td>Cost reduction</td>
<td>5</td>
<td>The extent to which the ES results in the reduction in labour, inventory and administrative expense.</td>
</tr>
<tr>
<td>OI-9</td>
<td>Systematic information management</td>
<td>5</td>
<td>ES results in the improvement in terms of information processing and management in a corporation.</td>
</tr>
<tr>
<td>OI-10</td>
<td>Automation</td>
<td>4</td>
<td>The extent to which the system eliminates manual complexity and workload in business activity.</td>
</tr>
<tr>
<td>OI-11</td>
<td>Better Business decisions</td>
<td>5</td>
<td>The effect of ES in terms of better corporation strategy making for business planning and marketing response.</td>
</tr>
<tr>
<td>OI-12</td>
<td>Overall competitiveness</td>
<td>3</td>
<td>The extent to which the ES aid in overall competitiveness.</td>
</tr>
</tbody>
</table>
Table 6.5 The measures of Organizational Impacts

6.6.1 Description of items of Organizational Impact

Information technology has a long history of being used to facilitate a better corporation’s operation. The benefits realized in the organization’s operation are the most immediate outcome yielded by the implementation of ES. There is evidence that investment in IT/IS to streamline processes and automate transactions provides business benefits by a speeding-up process, substituting labour, and increasing operational productivity (Shang and Seddon 2002). The Identification survey identified several effects of ES reflected in the operation aspects, including improvements of the outcome or output, cost reduction, office automation, business process optimization, and enhancement of overall operational productivity in the company.

**Business process optimization** is a radical impact typically accompanying ES adoption. ES implementation provides Chinese enterprises with an opportunity to crystallize and re-define their previous business process, then implement a more accountable, standardized, transparent business process. Some original boundary of functionalities has been eliminated or re-segmented after the extensive business process optimization. Twenty citations addressed the effect on business process optimizations.

**Automation** is a significant change enacted by IS. The measure of automation describes the extent to which the system eliminates manual complexity and workload in business activity. The IT-enabled and automated processing results in many tangible and intangible benefits, such as reduced labour cost and increased productivity. Four citations account for the item of automation in the survey. Respondents said that ‘I start working in PETRO since 2003 and witness SAP system implementation and go-live. I am aware of the enhancement in terms of automation since SAP implementation in PETRO.”
Improved outcome of functionality depicts the extent to which the ES results in better outcomes and outputs to fulfil internal or external customers’ requirements. According to the survey, users in different business functions reported a variety of improvements in terms of working outcomes or outputs due to ES. For instance, one user from the Commercial Department believed that integrated and concurrent information in SAP allows them to remain close to customers and to provide the customers with better service. Furthermore, financial employees also appreciate the SAP financial module since it speeds up financial reports development.

Improved overall productivity and cost reduction pertains to operational benefits realized by the adoption of ES. ES is comparable to a traditional investment in many ways; for instance, they will entail immediate operational benefits similar to an investment in production equipments.

Shang (2002) argues that ES is able to offer benefits in terms of many operational aspects, such as productivity improvement, quality improvement, cost reduction and cycle time reduction. The Identification survey indicates the benefit of organizational productivity improvement. Seventeen citations address the issue. Most citations stated a better business efficiency and operational productivity was achieved since the SAP system was implemented. In line with the observation of an overall increase in productivity in the company, respondents also reported the effect of SAP in terms of cost reduction. Five citations reported reductions in labour costs, administrative costs and production costs.

According to Chinese respondents in the survey, SAP is much more than a tool to enhance individual and operational productivity. It highly impacts on enterprise management in Chinese organizations. These measures below focus on the impact of ES on organizational management, including Enterprise management optimization, enterprise integration, business control, business
decision making, information management, information transparency and information trustworthiness.

**Information transparency** depicts the extent to which the information in the system is accessible. Compared to the information availability issue, this item is a more authorization-specific item, emphasizing the ease or difficulty with which the user who needs the information is able to get access to that particular information. However, this item is also different from the item denoting ease of use of a system. The latter item points to the technical design of a system. It is acknowledged that the goodness of a system design, such as being user-friendly and the sophistication of the data query function, will affect the physical access to the information stored inside the system. However, information transparency points to a more critical organizational issue, namely, the mechanism of information management that allows people to access, transmit and share information properly. The survey resulted in a clear awareness of the information authorization issue among the sample respondents. Of the 31 related citations, 27 citations praise the way that SAP enhances information sharing and access. PETRO’s business and management become more transparent. Three citations commented on the inflexibility of the authorization management, which restrained their work.

**Enterprise management optimization** refers to the extent to which the adoption of ES contributes precision and structure in the corporation’s management. The Identification survey indicated that a large number of respondents recognized the far-reaching significance of the SAP system: it is much more than a IS application aiding in information processing and management. Appropriate usage and assimilation of this type of ES will have fundamental impacts on organizational management and operation. Twenty-one citations account for this organizational impact. Respondents commented that the SAP system ‘*refined PETRO’s enterprise management (No.1.3)*’ and allowed ‘*realizing enterprise management standardization and systemization in the company (No. 16.57)*’.
Enterprise integration/cooperation pertains to the integration across organizational functions. Lim et al. (1997) define integration: ‘integration of several business processes is to make the running of these processes as if there is only one business process (p.493)’. Functional integration is an important ability of ES. A corporation’s functions can be streamlined and coordinated as an integrated entity, sharing mutual vision and moving toward common strategic goals. All departments communicate and network on an integrated platform. Business runs smoothly from one function to another. The ES harmonizes the relationships inside the company, which paves the way to productivity. Nineteen citations identified in the survey account for this item. A number of respondents commented on the enterprise integration feature: ‘SAP streamlined all departments as a whole company (No. 13.49) or ‘Through the creation of a PR to the final payment at the end of a procurement process, SAP streamlines operations across a couple of department (No.62.591).’

Better Business decisions depicts the effect of ES in terms of better corporation strategy making for business planning and marketing response. On-line and real-time information enabled senior managers to make business decisions based on accurate and consistent information. Rapid access to performance-related information also permits forward-looking decisions, which assist the manager in quick market responsiveness and effective planning of resources and service. Respondents in the survey commented that ‘SAP greatly support strategic manager to make accurate decision (No.15.55), and ‘SAP support the development of sales strategy in PETRO (No.36.144).’

Business control refers to the extent to which the ES facilitates stronger management control and reduces possible risks. Due to the integrated and automated process embedded in the ES, enterprise virtually implemented a business control mechanism, giving the manager strong control and visibility of the business. To some extent, ES increases the potential for centralization as this provides the strategic manager with accurate and reliable evidence generated from the shop floor level. ES make a lot of hidden issues visible, strengthening centralized control. As one respondent commented, ‘SAP is a
mutual supervision mechanism if it is used properly... Workflows became visible and prevented unusual human intervening (No.62)’.

**Systematic information management** refers to the fact that ES results in improvement in terms of information processing and management in a corporation. Regardless of the specific purpose of an IS, the basic function of IS is to process information by performing operations: capturing, transmitting, storing, retrieving, manipulating and displaying information. Respondents from the identification survey contended that the SAP system aided in efficiency and effectiveness in relation to information management. They commented that ‘the SAP provides essential solution to improve our data management (No.138.502)’ and ‘the productivity of information processing has been greatly enhanced comparing with the previous data process (No. 21.78)’.

Finally, the identification survey indicated that ES aids in **overall corporate competitiveness** in PETRO. Respondents commented that the SAP system established a good corporate image because of flexible and quick responses to customer requirements. The utilization of ES helps to maintain a competitive edge in the ever-increasing competitive Chinese market.

**6.6.2 Observations made on the dimension of Organizational Impacts**

**Observation 1: invisibility of workgroups impacts**

Prior studies suggest the significance of the dimension of ‘Workgroup Impact’ in the evaluation of the IS success (Barua, Kriebel et al. 1995; Myers 1997; Ifinfedo 2006). However, Myers (1997) argue the necessity of measuring the effect of IS on the workgroup, as workgroup performance is an important intermediate stage between the individual and the organization. Barua et al. (1995) found that the most significant contributions of IT investments occur at low organizational levels, where they are implemented.

A workgroup is defined by Ifinfedo (2006) as ‘sub-units and/or functional departments of an organization (p. 18)’. Ifinfedo (2006) extends the dimensions of the ES success model of (Gable, Sedera et al. 2003) by adding two new dimensions, ‘Workgroup Impacts’ and ‘Vendor/consultant support’. The author
asserts the significance of evaluating the workgroup performance in the ERP environment, ‘essentially, the underlying philosophy of ERP systems underscores the arguments of Myers et al. Namely, ERP systems are usually acquired to enhance efficient cross-functional operations within the adopting organization (p.18)’.

However, opposed to the arguments of (Ifinfedo 2006), this study suggests that the significant effect of the ES (specifically ERP) at the workgroup level is to make the intermediate organizational unit invisible. Respondents emphasized ‘interdepartmental co-operation’ and ‘interdepartmental communication’. The business was re-segmented and the boundary of functions was weakened due to the integrated process embedded in the SAP system. The SAP system helps the company to overcome the functional differentiation that occurs when companies decompose themselves into smaller more specialized organizational units that are easier to manage. One respondent said that ‘SAP integrates each department as a whole entity and strengthens the relationship among each department (No.32)’.

Notably, this impact is more meaningful for the Chinese business context. The reviewing of the Chinese ES adoption literature indicates a value of ‘individualistic collectivism’ in China (Lu and Heng 2008); where small groups or family value and interests are emphasized and protected, a coordinated behaviour across sub-unit or workgroup is not attained easily in Chinese organizations. In this circumstance, the ES would be especially beneficial to Chinese organizations, if the ES assists in eliminating the old ideas of individualistic collectivism, enabling unified vision of firms, and forcing organizations to move away from function-based systems towards process-oriented integrated systems.

**Observation 2: The far-reaching impacts on the enterprise business model in Chinese organization**

The chapter on the context research demonstrates a misalignment between ES and the Chinese company, due to a fundamental incompatibility between the prescribed ES business model and the traditional Chinese management system.
Significant misalignments exist in terms of information transparency, business process, and decision making. The researcher also argues that the most significant impact of ES is arguably the radical change of Chinese conventional management practice enabled by the ES standard business model. In line with this argument, this study found supportive evidence through the identification survey, where the respondents were aware of significant effects of the SAP system in light of the improvement of enterprise management in the Chinese organization; 103 citations (64% of Organizational Impact citations) posit to this issue. Specifically, respondents in the company commented on several management-related impacts which were enabled by the SAP system, including better information transparency, more rational business decisions, business processes and business control. A detailed discussion accounting for the issue is presented in a later Chapter (section 8.1.2).

**Observation 3: the recognition of operational benefits**

The identification survey indicated that operational benefits are another notable type of benefits yielded by Enterprise Systems. Information technology has a long history of use in promoting corporations’ operational activity, such as cutting costs, raising outputs by automating basic, repetitive production operations (Shang and Seddon 2002). Scanning the literature suggests that IS-enabled operational benefits have been included in prior IS evaluation models as imperative measures of effective IS adoption (DeLone and McLean 1992; Shang and Seddon 2002; Gable, Sedera et al. 2008). Given that ES streamlines business process and automates day-to-day transactions, users would expect ES to offer benefits in terms of cost reduction, speeding up processes, substituting labour, and increasing operation volumes. Accordingly, PETRO have experienced a number of operational benefits since their implementation of the SAP system, including improved overall productivity, improved outputs and outcomes, and cost reduction.
6.7 User Quality

A key observation in this study is that ES and ES impacts are not simply a matter of technology; it is also relevant to those who use the technology and how the technology is being used. The identification survey indicate that eligible users are those who appreciate the value of ES and make the most of the system; those who have appropriate attitude and expectation of the ES artifact; as well as those who acquire sufficient knowledge and the usage skills of the ES. In this study, a user-related construct was visible through the data analysis, titled ‘User quality’, depicting the system-related knowledge, skill and understanding of a user. It is noted that, though this construct focusing on individual level of analysis and relating to some consequences attributed to the interaction with the Enterprise System, this construct is different from the one of ‘Individual impacts’. The latter construct depicts the system impacts on individual job performance, and function-related capability and effectiveness, on behalf of the organization. However, the construct discussed here focuses on competence in relation to the specific technology. This technology-related capability serves as an important complementary competence required in the context of contemporary enterprise systems.

Results from the identification survey indicate 3 measures pertaining to the dimension: 1) system-related knowledge, 2) system-related skills, and 3) system understanding. Five measures were instantiated with 45 citations, 7% of the total amount of the data corpus. Table 6.6 depicts the 3 measures identified through the Identification survey.

<table>
<thead>
<tr>
<th>No.</th>
<th>Measures</th>
<th>Citations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>UQ-1</td>
<td>system-related knowledge</td>
<td>10</td>
<td>The extent to which the user is proficient with knowledge related to specific system</td>
</tr>
<tr>
<td>UQ-2</td>
<td>system-related skills</td>
<td>11</td>
<td>the extent to which the user is innovative or explorative in terms of using system and computers. They can handle complicated</td>
</tr>
</tbody>
</table>
Table 6.6 The measures of User Quality

<table>
<thead>
<tr>
<th>UQ-3</th>
<th>situations</th>
</tr>
</thead>
<tbody>
<tr>
<td>system</td>
<td>the user’s understanding of ES is the domain that estimates acknowledgement,</td>
</tr>
<tr>
<td>understanding</td>
<td>attitude, a sense of value, and adaptability on the end-user computing</td>
</tr>
<tr>
<td>21</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>42</td>
</tr>
</tbody>
</table>

6.7.1 Description of measures

Respondents addressed implicit relationships between their user characteristics and the perceived impacts of the enterprise system. This section will provide descriptive accounts of each emergent measure; representative quotes will also be presented to address the conceptual content of the measure.

System-related knowledge depicts the extent to which the user is proficient in knowledge related to the specific enterprise system. This measure describes the issue of ‘know what’, namely, the extent or variety of different features, functions, and other technical knowledge that an individual possesses and can bring to bear on his or her job. Specific to the survey, a number of respondents conveyed concerns about their insufficient knowledge of SAP. They noted that, ‘because of lack of systematic SAP training, I know very few features of the system (No.111.412)’, or ‘Except for the functions I often use, I don’t know much about the system (No.136.485)’.

System-related skill refers to the extent to which the user is innovative or explorative in terms of using the enterprise system. Compared to the measure related to system knowledge, this measure is concerned about the issue of ‘know how’. In other words, it refers to how proficient a user is in being able to apply ‘declarative knowledge’ to their work. It also refers to whether or not a user is innovative in using the system to deal with complicated situations. The survey in PETRO indicates a general level of command of the SAP system among users in the company. Some respondents expressed concerns about their own skills in using the system. They were afraid that insufficient system skills would impede the overall effectiveness of the system. It is also noted that
several respondents made in-depth comments on the current state of system-related skills among users in the company. They detected a generally disappointing situation with respect to proficiency with the SAP system in PETRO.

‘The loss of super users and experienced users reduced the capability of handling complicated situations and business scenarios. Meanwhile, insufficient training for novice users gives rise to the situation that they know how to perform only some simple task (No. 21)’.

**System understanding** refers to the domain that estimates acknowledgement, attitude, a sense of value, and adaptability to the ES. Contemporary IS requires tremendous effort from users. It is people who put the system into life, make it happen and have it work in an effective way. Users’ attitude towards the ES and the related organizational changes will affect the degree of user acceptance and utilization of the system, and consequently will affect the overall effect of ES in the adoptive organization. According to the I-survey, a few respondents attached the importance of Etiquette of system usage. They argued that the pre-defined standard workflows request close adherence to the imposed procedure and rules, and users are not allowed to process transactions casually. One of the respondents pointed out that

*The reliability of SAP is partially dependent on the defined rigorous rules of system operation... however, potential risks exist in PETRO. Because the notion of compliance to the system-defined process and operations has not deeply rooted in some user’s mind, they still process transactions as they will (No. 21)*

Respondents contend that inappropriate conduct using ES is very harmful to the organization. Respondents cautioned that the characteristic of process integration in SAP make the issue more critical. One mistake which occurs will influence subsequent steps in the transactional processing chains. A representative example cited from the survey clearly demonstrates the harm of inappropriate conduct in system usage:
However, if one people use the system improperly, it would delay or impede subsequent procedure. For example, if the warehouse does not accept goods timely, the financial then cannot issue the payment according to the contract and incur payments in arrears. This will hurt company’s credit in market. Moreover, the other parties of the contract can sue us because of violation of contract. In a summary, SAP should be an assistant system for corporation’s business running and management. However it would cause damage and loss if the system is used improperly (No.62).

Enterprise Systems is the type of IT application that companies adopt to re-structure or re-specify the interactions among groups of employees or with business partners. McAfee (2006) defined Enterprise IT (Enterprise Systems) as an IT proposing to specify business processes and argues that companies cannot adopt EIT without introducing new interdependencies, processes and decision rights. Those changes cannot happen slowly; rather, they have to occur as soon as the new systems go live. The radical organizational changes imply that ES, for instance, the ERP system, is not only an enterprise transaction processing system but a new concept and approach to doing business in a company. However, not all companies welcome such radical changes, nor are all people in a company aware of the true value of such process-oriented IT applications and get ready to adapt to the new changes enacted by the system.

The empirical investigation of a participating company was in line with the above arguments. A number of respondents contend that ES brought a lot of radical changes that would contradict previous conventional practice and vested interests; in that case, ES and further modification are not always welcomed. As they said:

‘It is really difficult to carry out system upgrade or modification if the modification involves other modules. Considering their internal interests, all functional units hesitate for change, no mention developing new functions and process (No. 48)
In conclusion, the I-survey indicates that users’ understanding of the system, attitude to the system-related changes and correct conduct in using the ES will largely contribute to the success of ES. Otherwise, if an ES is implemented without positive reactions, and furthermore receives resistance from users, the ES project can hardly turn out to be a success.

6.7.2 Revisit User Quality

This section will revisit the relevance of the dimension of User Quality by examining related literature. As scant related literature was found in the IS evaluation field, the researcher expanded the review process to other relevant areas, including end-user computing evaluation, end-user training, learning theory and computer literacy. Through an expansive review, the researcher identified several relevant constructs, including user competence, computer self-efficacy, individual absorptive capacity, and end-user computing competence. Those extant theories and constructs enrich the researcher’s understanding of the emergent theme of User Quality in the study. Based on the empirical data and the prior study of the user-related constructs, the researcher re-specified the ‘User Quality’ dimension. This section will discuss the results of revisiting the dimension.

6.7.2.1 A classification of user-related attributes

Previous studies contend that user attributes have an important role in the eventual success of IS (Goodhue and Thompson 1995; Venkatesh 2000; Sabherwal, Jeyaraj et al. 2006; Kim and Kankanhalli 2009). Based on an intensive literature review, Sabherwal et al. (2006) theoretically modelled a broad user-related concept which included four commonly referenced user characteristics in IS success and effectiveness studies: 1) user experience, 2) user attitude, 3) user training and 4) user participation. Sabherwal et al. (2006) also proposed a set of positive relationships between user-related constructs and IS success constructs. Table 6.7 illustrates the definition of each user-related construct and the supportive interrelations with IS success.
<table>
<thead>
<tr>
<th>User-related construct</th>
<th>Definition</th>
<th>Related constructs</th>
<th>Supportive interrelations with IS success</th>
</tr>
</thead>
<tbody>
<tr>
<td>User experience</td>
<td>Duration or level of an individual’s prior use of computers and ISs in general</td>
<td>experience</td>
<td>User experience → System Use</td>
</tr>
<tr>
<td>User attitude</td>
<td>A user’s affect, or liking, for ISs and for using them: playfulness, anxiety…</td>
<td>Attitude toward behaviour; affect, anxiety; attitude toward using technology</td>
<td>User attitude → System Quality</td>
</tr>
<tr>
<td>User training</td>
<td>The extent to which an individual has been trained about ISs</td>
<td>Indirectly related to Self-efficacy</td>
<td>User Training → System Quality</td>
</tr>
<tr>
<td>User participation</td>
<td>The assignments, tasks, and behaviour that users, or their representatives, perform during the IS development project, or the user’s psychological state of involvement in the project.</td>
<td>User participation; User involvement</td>
<td>User participation → System Quality</td>
</tr>
</tbody>
</table>

Table 6.7 User-related constructs in IS Success studies and interrelations with IS-S constructs (adapted from Sabherwal et al (2006))
The study by Sabherwal et al. (2006) made notable contributions with respect to user-related issues in the success of IS. Before this paper, in the IS success field discussions on user-related issues were scattered, limited to a single perspective, never aggregated in any comprehensive way, and lacking a common theme. Sabherwal et al. (2006) made a useful classification of user characteristics and empirically examined the relationships between users and the IS success constructs. The study suggests positive relationships between attributes of user and IS effectiveness and success. These findings motivated further investigations on user-related constructs and their possible impact on IS effectiveness and success.

However, it is noted that their conceptualization of user-related concepts remain at a rather broad level and covers a large domain, targeting a large user base, ranging from the IS implementation stage to IS post-adoption, including general experience, affections and training in general Information Technology rather than in specific IS applications. Therefore, not all components of the user concept might relate to a particular study. Researchers need to identify and re-specify the most relevant content domain of user characteristics before applying the classifications made by Sabherwal et al. (2006).

We cautiously consider that, though this classification is instructive, it is not applicable to this study. Firstly, this research attempts to identify relevant subjective measures applicable to evaluating Enterprise Systems during the phase of system stability and diffusion in the Chinese context. Hence, the construct of user participation in the development stage is out of the scope of this study. Secondly, though user training is related and supported by the empirical evidence in the Identification survey, it is more related to the quality of IT functions than to an attribute of the user. As with to much literature on IS evaluation, this study regards the user training issue as a component of IT functions and will discuss this issue in later sections. Thirdly, this study investigates user attributes in the context of organizations and mandatory ES usage. Therefore, the research focuses only on those user attitudes related to the ES and using the ES in a working environment. Most of the intrinsic and personal characteristics included in the Sabherwal et al. (2006) User Attitude
construct, such as computer playfulness, anxiety, self-motivation, are not in the scope of our discussion, because, although they are useful in the study of voluntary IS continuing use, they might not be sensible in the context of a working environment where the ES is imposed.

As the Sabherwal et al. (2006) classification of user attributes is built on reviewing seminal papers and classic theory in the IS success area, it presents a general view of the state of studies on user-related issues in the IS Success study stream. The researcher concluded that the user-related research in the IS subjective evaluation area (IS success/effectiveness/impact) is not sufficient. The most current and comprehensive classifications of user attributes are not very useful to answering the specific research questions in this particular study.

6.7.2.2 Relevant User constructs

Given the results from reviewing user-related issues in the IS Success literature, an expansive review was conducted in order to identify relevant constructs in relation to users in the context of IS utilization. Relevant papers and essays were searched through the ProQuest academic database platform, by using ‘end-user computing’, ‘end-user satisfaction evaluation’, ‘IS Success’ as searching keywords. Fifty-eight papers pertaining to several related study areas were regarded as relevant after reviewing the topic and abstracts of these papers. Of the 58 relevant papers, 19 papers discuss user-related constructs intensively and 18 of them test their constructs empirically. Table 6.8 presents a summary of the user-related constructs identified in the expansive literature review.

The expansive review indicates that ‘competence’ is the most frequently investigated concept in terms of users. The term of competence was first introduced by David McClellend in early 1970 in the psychology discipline, and it has since been used in many different areas of research, including education, management, human resources and information system (Bassellier, Reich et al. 2001). Generally speaking, competence is the total set of knowledge, skills, and attitudes as the action characteristics of an organizational member who can do his or her tasks outstandingly and
efficiently in an organizational environment (Yoon 2009). Spencer and Spencer (1993) presented five major components of competency: motives, traits, self-concepts, knowledge, and cognitive and behavioural skills. In learning theory, competence is conceptualized in terms of outcomes associated with learning. Three types of learning outcomes, cognitive outcomes, skill-based outcomes, and affective outcomes, correspond to different type of competence (Kraiger, Ford et al. 1993; Marcolin, Compeau et al. 2000).

The concept of ‘competence’ is quite new in the IS discipline. The review suggests that it was not until the late 1990s that IS scholars began to investigate the related construct of user competence. However, competence is defined and used in a variety of ways. Munro, Huff et al. (1997) define ‘user competence’ as ‘a multi-faceted concept which is composed of an individual’s breadth and depth of knowledge of end user technologies, and his or her ability to creatively apply these technologies (p.45)’. In the end-user computing area, Yoon (2008, 2009) proposed a concept of ‘End-User computing competence’, defining the competence as ‘a total set of knowledge, technology, skills and attitudes which function as action characteristics of an organizational member who can outstandingly and efficiently do his or her tasks in a computing environment (p.472)’. Meanwhile, a variety of concepts, in such terms as ‘meta-competence’ (Brown 1993), ‘IT competence of business manager’ (Bassellier and Benbasat 2001), ‘Individual’s knowledge of IS’ (Freeman 2001) and ‘proficiency of user’ (Sedera and Dey 2008), were also identified through the course of the expansive review.

The variety of definition and conceptualization generates some confusion as to the meaning and domain of the concept of ‘competence’. Marcolin, Compeau et al. (2000) report that the proliferation of approaches on the concept of competence has hindered the creation of a cumulative body of knowledge. Confusions often arise when competence is used as a synonym for performance, and otherwise is used interchangeably as ‘self-efficacy’.

Bassellier and Benbasat (2001) point out that the interchangeable usage of competence and performance resulted in confusion, ‘Competence is the enabler,
providing the means to a better performance. By mixing competence and performance, outcome and process are confused (p.162)’. The reason for the confusion is the difficulties in assessing competence. Performance is applied as a proxy for the evaluation of competence. Lewis, Agarwal et al. (2003) and Jasperson, Carter et al. (2005) assert that, while the competence of users is related, many other factors, such as motivations, expectation, affection, task fit and relevance, may jointly imply performance. Thus, this study regarded competence as the potential ability that leads to effective and efficient accomplishment of one’s task in the organizational context.

The review also found that ‘User Competence’ and ‘Computing Self-efficacy’ are the two most extensively used constructs for measuring individual’s competence in using information technology (Munro, Huff et al. 1997; Henry and Stone 1999; Marcolin, Compeau et al. 2000; Dishaw, Strong et al. 2002; Bassellier and Benbasat 2004; Gravill, Compeau et al. 2006; Scupola 2008; Yoon 2008; Ng and Kim 2009; Yoon 2009). Our review of the previous applications of the two constructs indicated that, though these two user-related construct are actually different, they have been used interchangeably in many IT adoption and theory of Planned Behaviour studies to operationalize users’ factors in the context of IT. Otherwise, self-efficacy is employed as a surrogate of competence. It was not until the study of Marcolin et al. (2000), that the confusion of Self-efficacy and User Competence were clarified. The authors demonstrated that the constructs of ‘Self-efficacy’ and ‘User Competence’ are two different conceptualizations of the latent variable of competence, and each entails different rating approaches to measuring the variable. The former is the affective conceptualization and points to the extent to which individuals have a sense of confidence of their ability in accomplishing a task, while the latter is the cognitive conceptualization pertaining to the level of knowledge that the individual actually possesses.

Besides the commonly used concept of ‘competence’, other user-related constructs are also identified through the review. For example, Park, Suh et al. (2007) proposed a construct of users’ absorptive capacity, arguing that the individual’s idiosyncratic capability would help improve individual
performance and eventually increase organizational competence. The construct consists of 3 different absorptive capabilities, including capabilities for understanding, assimilating and applying specific IS.

<table>
<thead>
<tr>
<th>PAPERS</th>
<th>USER-RELATED CONSTRUCTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Munro et al. 1997)</td>
<td>End User Competence (EUC)</td>
</tr>
<tr>
<td>Munro et al. 1997</td>
<td>Computer self-efficacy</td>
</tr>
<tr>
<td>Henry et al. 1999</td>
<td>Self-efficacy</td>
</tr>
<tr>
<td>Nambisan et al. 1999</td>
<td>User propensity to innovate in IT</td>
</tr>
<tr>
<td>Marcolin et al. 2000</td>
<td>User Competence</td>
</tr>
<tr>
<td>Bassellier et al. 2001</td>
<td>IT competence of Business management</td>
</tr>
<tr>
<td>Jawahar et al. 2001</td>
<td>Attitude towards working with computer</td>
</tr>
<tr>
<td>Freeman 2001</td>
<td>Individual’s knowledge of IS</td>
</tr>
<tr>
<td>Dishaw et al. 2002</td>
<td>Computer self-efficacy</td>
</tr>
<tr>
<td>Lewis et al. 2003</td>
<td>Beliefs about IT use</td>
</tr>
<tr>
<td>Malhotra and Galletta 2004</td>
<td>users’ commitment and motivation</td>
</tr>
<tr>
<td>Matthing, Kristensson et al. 2006</td>
<td>Technology readiness</td>
</tr>
<tr>
<td>Gravill, Compeau et al. 2006</td>
<td>User competence</td>
</tr>
<tr>
<td>Park et al. 2007</td>
<td>User’s absorptive capacity</td>
</tr>
<tr>
<td>Scupola 2008</td>
<td>Individual level competency</td>
</tr>
<tr>
<td>Sedera et al. 2008</td>
<td>Degree of Proficiency of user</td>
</tr>
<tr>
<td>Sun and Zhang 2008</td>
<td>Personal innovativeness in system use</td>
</tr>
<tr>
<td>Yoon 2008,2009</td>
<td>End-User computing competence</td>
</tr>
<tr>
<td>Ng et al. 2009</td>
<td>Usage competency in User empowerment</td>
</tr>
</tbody>
</table>

Table 6.8 Relevant competence constructs related to the User
6.7.3 Respecifying the dimension of User Quality

Revisiting recent user constructs indicates a consensus agreed by prior studies, namely, the system-related competence or capability should be assessed multi-dimensionally. These constructs present as measurable patterns of knowledge, skill, abilities, behaviours, and other characteristics that an individual needs to perform IT-reliant work roles or occupational functions successfully. Most identified constructs are a combination of relevant dimensions and measures, attempting to evaluate the user comprehensively.

To put these relevant constructs into perspective, linking with the emergent User Quality dimension in the identification survey, it is noted that existing user measures can be mapped into several main domains of user quality identified in the survey – knowledge-based quality, skill-based quality, and attitude-based quality – which aid in a close scrutiny and re-specification of the dimension of User Quality. Table 6.9 illustrates the re-specification of the dimension of User Quality.
<table>
<thead>
<tr>
<th>Measures of UQ</th>
<th>Description</th>
<th>items</th>
<th>Description of items</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge-based user quality</td>
<td>The extent to which the user is proficiency with knowledge related to specific system</td>
<td>breadth of IS explicit knowledge</td>
<td>refers to the extent or variety, of different end user tools, skills, and knowledge that an individual possess and can bring to bear on his or her job</td>
<td>Munro et al. (1997), Marcolin et al. (2000), Scupola (2008), Bassellier et al. (2001), Park et al. (2007), Ng et al. (2009), Yoon (2008, 2009), Gravill, Compeau et al. (2006)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Depth of IS explicit knowledge in specific domain</td>
<td>Depth represents the completeness of the user’s current knowledge of a particular sub-domain</td>
<td>Munro et al. (1997), Marcolin et al. (2000), Scupola (2008), Bassellier et al. (2001), Park et al. (2007), Ng et al. (2009), Yoon (2008, 2009),</td>
</tr>
<tr>
<td>Skill-based user quality</td>
<td>The extent to which the user is innovative or explorative in terms of using system and computers. They can handle complicated situations</td>
<td>Hands-on learned knowledge</td>
<td>The ability to move declarative knowledge (know what) to procedure knowledge (know how); and to speed up performance by moving beyond the step-by-step process into more fluid and efficient process</td>
<td>Gravill, Compeau et al. (2006), Park et al. (2007), Marcolin et al. (2000), Munro et al. (1997), Yoon (2008, 2009)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>innovativeness</td>
<td>the ability to creatively use system functions, transferring knowledge from one task to other novel tasks</td>
<td>Scupola (2008), Lewis et al. (2003), Nambisan et al. (1999), Sun and Zhang (2008),</td>
</tr>
<tr>
<td>system understanding</td>
<td>the user’s understanding of ES is the domain that estimates acknowledgement, attitude, a sense of value, and adaptability on the end-user computing</td>
<td>process adaptiveness</td>
<td>ability to understand the process view inscribed in the system, visualizing the organization as a set of interrelated processes</td>
<td>Bassellier et al. (2001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Value awareness</td>
<td>ability to understand the value the enterprise system</td>
<td>Yoon (2008, 2009), Bassellier et al. (2001), Malhotra and Galletta (2004)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Etiquette of system use</td>
<td>user adheres to standardized operations, rules codified in the system</td>
<td>Yoon (2008, 2009)</td>
</tr>
</tbody>
</table>

Table 6.9 The re-specification of the dimension of the User Quality
### 6.7.3.1 Knowledge-based user quality

Knowledge-based user quality is the measure pertaining to the extent to which the user possesses declarative, verbal or explicit knowledge of specific IS applications. Marcolin et al. (2000) conceptualized this type of competence as knowledge users have about what a technology is and how to use it. In learning theory, ‘declarative knowledge’ is the initial learning results in a learning process. In it the individual cognitively encodes a set of facts about a skill, and it is often referred to as the ‘know what’ type of knowledge Gravill et al. (2006). Similar to the notion of ‘declarative knowledge’, (Bassellier and Benbasat (2004) proposed a concept of ‘Explicit IT knowledge’ denoting the knowledge-based competence that enables a business manager to communicate with IT people. In this study, Explicit IT knowledge points to a wide range of the content domain of IT knowledge that business managers should be familiar with, including technology, application, system development, management of IT, and access to IT knowledge.

Freeman (2001) suggests that, before evaluating user knowledge, the evaluator should ascertain whose IS knowledge, what kind of IS knowledge and what IS knowledge domain they are attempting to evaluate. In this study, the measure of ‘knowledge-based user quality’ attempts to evaluate ES end-users in terms of their explicit/declarative knowledge of the particular ES. The triangulation of extant measures and empirical evidence gathered in the I-survey helps to re-specify this measure with two sub-items: the breadth of IS-explicit knowledge and the depth of IS explicit knowledge in the specific domain.

In the context of ES, the breadth of IS explicit knowledge refers to the extent to which the user has a broad knowledge base of the ES; for instance, they know a variety of functions and modules of SAP R/3 system. As to the survey, some respondents comment that SAP R/3 is such a large system, and they know only very few functions and features of the system.

The depth of IS-explicit knowledge refers to the completeness of the user’s current knowledge of a particular ES sub-domain. For instance, a user fully acquainted with the Financials module of SAP system can identify what
functionality and features exist within that particular system module, understand which function processes a specific transaction, and understand where the alternative options are located in a specific table.

Of note, Sedera and Dey (2008) extend knowledge-based competence evaluation by including relevant functional expertise. They argue that, in the context of Enterprise Systems, evaluation of the degree of proficiency of individual users should include both software knowledge and business process knowledge. This study attaches function-related knowledge to the measure of individual learning in the dimension of Individual Impacts, which includes organizational learning enabled by the interaction with ES.

6.7.3.2 Skill-based user quality

Skill-based user quality is the measure pertaining to the user’s ability to creatively apply the declarative IS knowledge they acquire. This measure corresponds to the second conceptualizations of competence put forward by (Marcolin, Compeau et al. 2000) with relation to users’ skill. According to learning theory, skills are later learning results subsequent to the accumulation of knowledge.

Even though the command of IT/IS knowledge is important, it is recognized that knowledge by itself is not sufficient to describe one’s competence (Nambisan, Agarwal et al. 1999; Gravill, Compeau et al. 2006; Park, Suh et al. 2007; Scupola 2008; Sun and Zhang 2008; Ng and Kim 2009; Yoon 2009). Gravill et al. (2006) argue that it is crucial to develop ‘procedural knowledge’ after declarative knowledge is gradually accumulated and better organized. At this stage, meaningful cognitive structures begin to form, and individuals begin to link the acquired knowledge to their performance of the task. Similar to Gravill et al. (2006), Bassellier and Benbasat (2001) propose ‘tacit knowledge’ denoting the user’s skill at a more advanced level of competence than ‘explicit knowledge’, and the ability to perform well and ‘know how’.

It is noted that skill is gradually developed through experience and experimental training. Bassellier and Benbasat (2001) indicate that practice, or experience, where the individual modifies his/her actions based on the results
of previous actions, builds competence through the enrichment of ‘know how’. Along with the evolving practice, experience, experiments, and training, individual skill is developed progressively and intensified stage by stage.

The first stage of skill development happens immediately with the acquisition of declarative knowledge. Users start to link this type of static knowledge to actions required in a real task. During this phase of skill acquisition, users develop their ability to do the actual IT/IS applications hands-on, and to speed up performance by moving beyond the step-by-step processes first learned into a more fluid and efficient process (Marcolin, Compeau et al. 2000). Official training and education are effective approaches to having ES users become sufficiently familiar with ES systems, and to use them properly.

The second stage of skill development is innovativeness in IS usage, presenting as the capability to transfer knowledge from one situation to another (Scupola 2008), and to generalize the knowledge to a novel task. A number of researchers conceptualize this level of IS skill as ‘innovativeness’, in the terms of ‘individual innovativeness’, ‘User propensity to innovate in IT’ or ‘Conceptual skills’ (Nambisan, Agarwal et al. 1999; Scupola 2008; Sun and Zhang 2008). Munro et al. (1997) developed a measuring dimension of ‘finesse’ to examine this phase of skill-based competence. Finesse, consisting of three aspects – creativity, self-sufficiency and ability to learn new things – emphasizes the capability of finding new ways to apply an existing IT/IS application, applying new solutions to deal with job tasks using the technology tool, and functioning well when problems barriers are encountered, in order to uncover the probable causes and possible solutions to those problems quickly. Park, Suh et al. (2007) conceptualize ‘innovativeness’ as the ‘absorptive capacity’ at the individual level. It is the individual idiosyncratic capability that would help improve individual performance and eventually increase organizational competency.

Accordingly, the researcher respecifies the measure of skill-based user quality with two sub-items in response to the two phases of IS skill acquisition. The first sub-item ‘hands-on learned ES knowledge’, corresponds to the first level
of skill development, where users experiment and start to apply declarative ES knowledge in the real work setting. According to the Identification survey, respondents said that the good usability of a system aids in their self-sufficiency in learning the system. The new employee can start using the system immediately with some assistance from experienced colleagues. Thus, we conclude that the first level of skill is easy to acquire by the user if the system is usable enough.

Corresponding to the more intensified system skill, the second sub-item was respecified as ‘innovativeness’, where the user develops sophisticated skills to deal with more complicated situations and to act creatively in performing a task. The identification survey illustrates the difficulties in attaining this level of skill among users. Though it is easy to get the preliminary skill in terms of SAP system operation, without proper training and education it is very difficult to develop real expertise in the system. Evidence from the survey confirms this:

*The potential risks: the lost of super user reduce the capability of handling complicated situation and business. The lost of experienced user and lack of training for new user give rise to the situation that the current user only know how to perform some simple task (No.21).*

Evidence also suggested that lacking the ability to use the technology creatively and flexibly will hinder the performance of both the individual and the organization.

*The staff turnover is quick in PETRO. In this case, the training for end user is very important. Good training can avoid the errors and mistakes caused by problematic system operation and lack of system knowledge (No.22).*

Thus, we concluded that individual (or organizational) performance could be enhanced when users gain a high level of skill in incorporating the ES in their task, reinventing their use of ES to fit to their task environment. Such reinvention and innovation is tightly related to the users’ ability to learn to use ES systems effectively.
6.7.3.3 Attitude-based user quality

Attitude-based user quality is the measure pertaining to the domain that estimates acknowledgement, attitude, a sense of value, and adaptability on the interaction with Enterprise Systems. Previous studies on ‘competence’ often focus on an individual’s knowledge and skill, and few investigate the cognitive component of competence of users in the IS-enabled work setting. Ability to perform well is not only a case of how well an individual is knowledgeable and proficient with the technology, task, and work process. Literature in the stream of IT adoption has made strong points that human perceptions and cognitions such as perceived ease of use, perceived usefulness, and intentions will influence technology adopting decisions and behaviours.

The attitude-based user quality corresponds to the third conceptualization of ‘user competence’ put forward by (Marcolin, Compeau et al. 2000) – affective competence, reflecting the affective outcomes in the learning theory (Kraiger, Ford et al. 1993). Though their affective conceptualization of competence points to a useful domain for evaluating characteristics of users, it needs further improvement. They conceptualized this aspect of competence in a broad manner, ‘encompassing all of the components of attitude considered by IS (cognitive, affective, intentional), as well as other motivation constructs (p.40).’ However, these authors subsequently operationalize the affective competence as ‘self-efficacy’ – ‘individual’s perception of his or her ability to successfully execute some specific task (p.40)’. The expansive literature review suggests that ‘self-efficacy’ is used either as an antecedent of competence, or as a proxy of the first type of conceptualization, the knowledge-based competence. It is inappropriate to be used as a surrogate to measure the attitude component of competence.

Accordingly, later studies implied some further understanding of this particular domain of affective competence. Drawing on the findings of extant research and implications from the Identification survey, this study conceptualized this affective component as an attitude-based user quality in the context of ES.
Three sub-items – process adaptiveness, values awareness, and etiquette of system use – constitute this measure.

- **Process adaptiveness**

  Bassellier and Benbasat (2001) indicate that one of the important cognitive competences (the cognitive element of tacit knowledge) is having a process-oriented view of the organization. Though their research purpose is to address the IT competence of managers, their process-oriented view become increasingly critical of users of all stakeholder groups, if the users are working in an organization where the business and production process is enabled or supported by a process-oriented ES. In this circumstance, users should have an ability to see beyond the tasks and hierarchy. They must adapt to a process view to see the organizational activities in terms of the business process crossing functional areas. The implementation of process-oriented ES, such as the SAP system, actually requires a cognitive adaptation of users in the adopter organizations. If only users would adopt the process view, were able to visualize the organization as a set of interrelated process, and could see their job as one step in the process chain, they would be in a position to accept the overall concept of ES and to make changes and adapt to the new work practice enabled by the system. Otherwise resistance and other negative results are on the way.

  The context study in chapter 3 reports an issue in terms of Chinese users’ inadequate cognitive readiness toward ES. In Chinese organizations which lack the necessary learning and changing environment, resistance to the ES is implicit yet hard to defy (Zhang, Cecez-Kecmanovic et al. 2008). End users keep pointing out the mismatch of user requirements and technical problems, yet are reluctant to deal with this problem with IT professionals (Avison and Malaurent 2007). Compliance made Chinese users nominally support the project, but in fact they did not take the training and participant opportunity seriously (Zhang, Cecez-Kecmanovic et al. 2008). This will eventually result in data of poor quality, inappropriate system configuration, and misalignment between user requirements and software.
Of note, the identification survey also reflects inadequate cognitive adaptiveness among PETRO’s employees. A respondent pointed that some users failed to recognize the importance of interdisciplinary thinking. Though they work in a shared R/3 platform, they were unable to see the value of an optimally coordinated and harmonized interdepartmental process. Furthermore, system modification is hard to initiate in PETRO, as each function is keen to protect its own interests. This lack of process-oriented thinking hinders the company’s ability to carry out restructuring of business processes in a continuous effort to adapt to changing environments and to leverage IT investment.

- Value awareness

Whether or not they are aware of it, users will gradually develop perceptions of the specific ES drawn from their experience with it (Lewis, Agarwal et al. 2003; Jasperson, Carter et al. 2005). These perceptions are a sense of the value of the ES, an assumption about its role within the organization, and also a vision of what it can or cannot do. This awareness of the values, roles and visions related to the ES adds a cognitive component to the attitude-based user quality that becomes embedded into an individual’s action, commitment and involvement in a specific context.

According to the context study reported in the previous chapter, value awareness of an ES application is not a given in Chinese organizations. A large number of strategy managers tend to misunderstand the ‘basic ERP concept’ (He 2004). Under a centralized economic environment, Chinese business executives tend to regard ES more as a pure computer software centralized package than as a tremendous opportunity to implement a more integrated business process and strengthened corporation management (Zhao and Grimshaw 1992; He 2004; Wang, Xu et al. 2005; Xue, Liang et al. 2005; Zhang, Lee et al. 2005; Ma and Loeh 2007; Woo 2007; Xu and Ma 2008). The lack of awareness of ES values among management hinders the effectiveness of ES, and results in a variety of issues including insufficient sensitivity, lack of communication, and inner resistance.
PETRO, the case we studied in the identification survey, reflects a generally positive attitude toward the SAP system among users. Many users expressed their positive perceptions of the system, as presented in previous sections denoting Organizational Impacts and Individual Impacts. Additionally, a number of users commented on the importance of the system and found their work dependent on the SAP R/3 process platform.

- Etiquette of system use

Finally, the study identified a sub-item entitled as ‘Etiquette of system use’ pertaining to the attitude-based user quality. This sub-item points to a domain related to the end-user computing mindset (Yoon 2008; Yoon 2009). It is a cognitive measurement factor identifying users’ recognition of computing security, ethics consciousness, and understanding of law and institutions related to the ES utilization.

The identification survey addressed the necessity to emphasize the etiquette of rules related to ES operations. Respondents recognized the importance of adherence to the law and institutions imposed by the SAP system. They were aware that the rigorous rule of system operation guaranteed the reliability of business, whereas violating the system encoded rules would lead to potential risks and losses.

6.8 IS Support Quality

DeLone & McLean (2003), after reviewing and evaluating discussions on Service Quality, decided to add the new construct in their updated IS success model, stating that ‘the changes in the role of IS over the last decade argue for a separate variable – the ‘Service Quality’ dimensions’. Researchers observed that, in today’s rapid changing and highly competitive business environment place, the IT function plays an ever-increasing important role that delivers service of good quality for end-user and organizations. Excellent IT service and support facilitates organizations to extract benefits from their IT investment and to obtain IT flexibility and capability. In this study, 9 measures associating with IT function support emerged through the Identification survey, converging
as a category of ‘IS Support Quality’, depicting the goodness of specialized service and support provided by IT functions and/or groups. The 9 measures includes 1) end-user training, 2) knowledge retention, 3) software maintenance, 4) infrastructure maintenance, 5) IT staff responsiveness, 6) IT staff competence, 7) communication with IT staff, 8) vendor/consultant responsiveness, and 9) cost-effective service of vendor/consultant. Table 6.10 presents a summary of these measures.

<table>
<thead>
<tr>
<th>No.</th>
<th>Measures</th>
<th>Citations</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>ISSQ-1</td>
<td>End-user training</td>
<td>16</td>
<td>the goodness of specialized training that is provided to end-users to increase their competence in utilizing the system.</td>
</tr>
<tr>
<td>ISSQ-2</td>
<td>Knowledge retention</td>
<td>6</td>
<td>The extent to which the IT function is effective in terms of retaining and codifying user’s system knowledge.</td>
</tr>
<tr>
<td>ISSQ-3</td>
<td>Software maintenance</td>
<td>9</td>
<td>the extent to which the IT staff is effective and efficient in software maintenance.</td>
</tr>
<tr>
<td>ISSQ-4</td>
<td>Infrastructure maintenance</td>
<td>6</td>
<td>the extent to which the IT staff is effective and efficient in computing infrastructure maintenance.</td>
</tr>
<tr>
<td>ISSQ-5</td>
<td>IT staff responsiveness</td>
<td>5</td>
<td>The extent to which the IS staff is responsive to users’ request</td>
</tr>
<tr>
<td>ISSQ-6</td>
<td>IT staff competence</td>
<td>3</td>
<td>The specialized technology skills and expertise exhibited by IS staff</td>
</tr>
<tr>
<td>ISSQ-7</td>
<td>Communication with IT staff</td>
<td>1</td>
<td>The manner and method of information exchange between the user and IT staff</td>
</tr>
<tr>
<td>ISSQ-8</td>
<td>Vendor/consultant responsiveness</td>
<td>2</td>
<td>The prompt service offered by a vendor, either directly or indirectly to the user to maintain the ES required by that organizational status.</td>
</tr>
<tr>
<td>ISSQ-9</td>
<td>Cost-effective service</td>
<td>1</td>
<td>The cost for outsourcing service from</td>
</tr>
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of vendor/consultant vendors or consultant against the perceived value of their service

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<tr>
<td>TOTAL</td>
<td>49</td>
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</table>

Table 6.10 The measures of IS Support Quality

6.8.1 Description of measures

End-user training depicts the goodness of specialized training that is provided to end-users to increase their competence in utilizing the system. According to preceding sections, competent users are a key complement of ES, multiplying the influence, power and impact of the ES. We also argue that user quality can be attained and improved through constant education. Preceding studies suggest that end-user training effectiveness can greatly impact end-user computing skills and end-user understanding of software applications. This training enables the development of more highly productive and skilled expert users of computer-based technologies (Shaw, DeLone et al. 2002; Rondeau 2010). As for the Identification survey, respondents in PETRO also conveyed their concerns about specialized training for the SAP system. All of the 16 citations relating to this issue reveal the fact of insufficient attention to training paid by the IT function. A respondent said that ‘I am not the initial user of PETRO’s SAP and did not attend SAP training as well. As I need to use SAP, so I picked up several necessary system operations for my job with the help of colleagues. Once mistakes happen, I have no idea how to deal with those situations, thus I strongly recommend that PETRO should reorganize SAP trainings (No.89.613)’. In spite of the lack of specialized system training, the respondents also comment on their need for user manuals of the SAP system: ‘Otherwise, a manual or workbook is necessary in that users can know what are the features and functions realized by the frequently used modules and how to use those features and functions (No.111.413)’.

Knowledge retention refers to the extent to which the IT function is effective, in terms of retaining and codifying the user’s system knowledge. Preceding studies explicitly demonstrate the importance of knowledge retention (Sedera,
Gable et al. 2004). Knowledge management studies contend that, though organizations acknowledge the importance of knowledge creation, they tend to neglect the fact that knowledge retention is equally crucial. Knowledge retention often involves codifying scattered tacit and explicit knowledge stored only in the minds of individual users. The biggest challenge for knowledge retention is the turnover of expert employees. Knowledge is lost as the technologically advanced employees leave the organization. According to the survey in PETRO, this company suffered from the loss of system knowledge and flexibilities due to the high speed of employee turnover. A number of respondents argued that the quick turnover in the company influenced diffusion of SAP. They observed that ‘loss of experienced key users and super users diminish the ability to deal with complex situation’, and ‘new users were lack of proper training and normally pick up basic system operation during work.’ Technical knowledge and skills developed by competent users are not retained and codified properly. The IT function did not devise mechanisms and media for formalizing users’ personal experience and knowledge. In this case, novice users hardly had access to retrieve the codified knowledge.

**Software and infrastructure maintenance** depict the extent to which the IT staff are effective in terms of software and infrastructure-related maintenance and support. Software and hardware/infrastructure maintenance are the conventional content of IT support. Both measures are often included in an instrument for evaluating end-user satisfaction (Bailey and Pearson 1983) and end-user support (Mirani and King 1994). Respondents in the identification survey were aware of the importance of effective system and computing infrastructure maintenance and 9 and 6 citations pertain to these two items respectively. A number of respondents contend that system effectiveness depends on the goodness of regular maintenance. The specialized software-related support includes anti-virus mechanisms, system change management, and data security management. Respondents also noted that the update of the IT infrastructure facility was attributed to an enhancement of system response speed.
**IT staff responsiveness, competence and communication** depict three aspects of service quality of IT staff. Responsiveness relates to how responsive IT staff have been to resolve users’ problems and difficulties in terms of ES software, hardware and other technical needs (Rondeau 2010). Of note, responsiveness is a valid measure included in SERVQUAL, a construct adapted from the marketing discipline, which denotes the willingness of IT function/staff to help users and to provide prompt service in the context of the Enterprise Systems (Mirani and King 1994; Pitt, Watson et al. 1995; Shaw, DeLone et al. 2002; DeLone and McLean 2003; Chang and King 2005). The field data yielded in PETRO also indicated an awareness of IT staff responsiveness. Five citations pertaining to the issue reveal users’ frustration at IS department delays in fixing SAP system problems and following up their request in system modifications and updates. One respondent said that ‘It takes long time to respond to user's requirement of SAP system modifications (No.1.4)’.

IT staff competence is another quality feature that has been mentioned by PETRO’s users. Saunders and Jones (1992) suggest that competent IS staff is able to interface successfully with users and management throughout the organization. Studies in SERVQUAL and IT function evaluations also include competence of the IT staffs as a measure to evaluate the goodness of service quality or performance of IS functions (Mirani and King 1994; Pitt, Watson et al. 1995; Shaw, DeLone et al. 2002; DeLone and McLean 2003; Chang and King 2005). According to the identification survey, respondents in PETRO indicated that, compared to other types of IS, the complex SAP system requires very knowledgeable and experienced IT professionals to maintain and support the system. Meanwhile, communication with IT staff corresponds to another quality of IS service, namely the manner and methods of information exchange between the user and the IT staff (Bailey and Pearson 1983). Concerning the communications issues, a respondent said that ‘I strongly recommend that IT department should collect user’s comments and suggestions in light of SAP system regularly. Hearing our user’s expectation and consistent system
improvement will make SAP system a real valuable tool to enhance overall productivity (No.93)

Vendor/consultant support refers to the quality of service rendered by a vendor, either directly or indirectly to the user, to maintain the ES required by that organization. With the growing need of outsourcing and purchasing IS products and services, service quality often involves external vendors (Petter, DeLone et al. 2008). Geffen (2000) argues that the responsiveness and cooperation of vendors affect user acceptance and perceptions of their IS products and service. Ifinfedo (2006) re-validated the (Gable, Sedera et al. 2003) IS effectiveness model – the IS-Impact model – and proposed to incorporate a dimension of vendor/consultant quality into this four-dimensional model, because the engagement of external expertise is essential for the success of ES in the adoptive organizations. Consistent with this, the field study indicated the effect of vendor support on the effectiveness of the SAP system in PETRO. The quality of vendor support throughout the life span of the SAP project has been described as a critical success factor (CSF) for ES acquisition. Respondents commented on response speed and cost of external supporting staff. They said that ‘SAP consultants often reply slowly (No.55.202),’ or ‘The quality of SAP is nice. However, the cost for SAP consultant is so expensive that we can’t afford to query the consultant directly (No.73.288)

6.8.2 Observations: The impact of end-user training on IS acceptance

The objective of end-user training is to create productive, motivated, and skilful technology users (Aggarwal, 1998). A main observation is that most measures of end-user training focus on improving end-users’ technical abilities (Mirani and King 1994; Chang and King 2005). Of note, the training effort is not limited to passing on system knowledge, but also increases the perceived value and understanding of the IS. It is a key facilitator in user understanding of change initiatives and improves attitudes to change (Rondeau 2010).

Lee and Lee (1995) pointed out that end-user training programs should include components to improve user acceptance. As supported by the statistical testing of the author’s causal model, end-user IS acceptance and end-user IS
satisfaction were identified as two major direct causal antecedents of end-user job satisfaction. Thus, end users need to regard the information systems they are currently using and the information provided by the IS as relevant and useful for their job performance as well as efficient and easy to employ, if they are to accept such systems.

It is noted that the training effort for enhancing the belief, understanding and acceptance of ES is essential and has become imperative to the company PETRO. The preceding section on User Quality discusses the current state of competence of users in PETRO. We argue that, in spite of knowledge and skill-related user competence, attitude-related competence also reflects an important component of the user quality. Ignorance of user education with regard to system acceptance will lead to frustrated results. Appropriate user education is an imperative facilitator of a firm-wide understanding of ES enabled change, and will positively promote employees’ openness and attitude towards those changes.

### 6.8.3 Revisiting prior IS/IT support and service literature

Nowadays, many IS success/effective researchers consider service quality (SQ) as an integral component that should be incorporated in IS evaluation frameworks. The most notable acknowledgement of service quality is the incorporation by DeLone and McLean of a dimension of SQ in their updated version of the IS Success model (DeLone and McLean 2003).

A legitimate definition of SQ is ‘the quality of the support that system users receive from the IS department and IT support personnel’ (Petter, DeLone et al. 2008). Scanning the literature pertaining to this issue reveals a rather ambiguous circumstance. Several IS study areas, such as End-user computing supporting, IS function performance, User Information Satisfaction and IS Success/effectiveness, employ idiosyncratic research approaches on service quality. The scattered discussions, varying study results and myriad constructs of conceptualization and operationalization hardly contribute an aggregated knowledge and understanding of SQ. There is not a commonly accepted measure among IS researchers for evaluating the service/performance/support
provided by IT functions. Among the various thoughts and discussions of SQ, the construct SERVQUAL receives most attention in the IS discipline. Adapted from the Marketing discipline, although with a continuing debate around its legitimacy, SERVQUAL was discerned as a comparatively appropriate measure gauging the quality of service in the context of IT/IS (Pitt, Watson et al. 1995; Jiang, Klein et al. 2002; DeLone and McLean 2003). Table 6.11 presents the 5 dimensions of SERVQUAL.

However, the study results of IT functions evaluation (Saunders and Jones 1992; Chang and King 2005) and End-user Computing Support (Mirani and King 1994; Shaw, DeLone et al. 2002) implicitly indicate that SERVQUAL measures just one aspect of the performances of IT functions or end user support. Having employed a Delphi approach, Saunders and Jones (1992) identify 10 performance dimensions for gauging the effectiveness of IT functions, among which 2 dimensions (pertaining to the IS functions operational efficiency and IT staff competence) correspond to dimensions of SERVQUAL. Chang and King (2005) also propose a scorecard approach to measuring IT functions, by which to explicate the goodness of service of IT functions, encompassing both quality and flexibility.

Reviewing the contending perspectives of IS functions service, the researcher tends to agree that quality of service is one aspect of performance of IS/IT support and functions. Though SERVQUAL is introduced as a generic measure encompassing general quality features of IS-related service (Pitt, Watson et al. 1997), measures of other aspects of IS/IT support will complement SERVQUAL, constituting a more comprehensive measure for IS/IT support.

6.8.4 Mapping emergent measures to extant models

Chang and King’s (2005) IS Functional Scorecard (ISFS) provides a comprehensive measure assessing service performance. In order to ensure the content validity of the measurement model, the entire SERVQUAL instrument and another 31 new measures proposed by IS supporting literature were included in the study. Afterwards, the validation test yielded 5 valid dimensions which present an encompassing measures that accounts for the
measurement of IS/IT support. Table 6.11 illustrates the associations among two extant IS support constructs and the emergent categories in the study. The mapping results, between emergent measures in this study and extant measure of ISFS and SERVQUAL, are largely supportive of these emergent measures. Given the primary research objective of the study, the researcher did not intend to conceptualize and test particular constructs related to IS support. The open-ended study design and brainstorming-style instrument helped the researcher to ground the category of IS Support Quality from the field study. However, we recognized that the limitation of the open-ended inquiry approach is obvious in the study, namely, we cannot guarantee a very thorough search of the completeness of a content domain. Having acknowledged these constraints, the researcher suggests that the emergent items related to IS support and functions might not be immediately measuring items operationalized into IS evaluation instrument, but they corroborate the preceding study results and point to several major aspects of IS support that should be considered by an IS evaluator.

<table>
<thead>
<tr>
<th>ISFS</th>
<th>SERVQUAL</th>
<th>IS Support Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Flexibility of services:</strong></td>
<td><strong>Tangibles</strong></td>
<td>ISSQ-3 system maintenance</td>
</tr>
<tr>
<td>Sufficient service capacity;</td>
<td>Physical facilities, equipment, and appearance of personnel.</td>
<td>ISSQ-4 infrastructure maintenance</td>
</tr>
<tr>
<td>Sufficient service variety;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sufficient people;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Extends external services</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>IS training:</strong></td>
<td><strong>Reliability</strong></td>
<td>ISSQ-1 End-user training</td>
</tr>
<tr>
<td>Useful training programs, variety of training; cost-effective service</td>
<td>Ability to perform the promised service dependably and accurately</td>
<td>ISSQ-2 knowledge retention</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISSQ-9 cost-effective service (vendor and/or internal)</td>
</tr>
</tbody>
</table>
Responsiveness of services  
Responds timely; timely completion;

Responsiveness  
Willingness to help customers and provide prompt service (Mirani and King 1994; Shaw, DeLone et al. 2002)

ISSQ-5 IS staff responsiveness
ISSQ-8 vendor/consultant responsiveness

Intrinsic quality of service provider  
dependable people; reliable people; understand needs; become better user

Assurance  
Knowledge and courtesy of employees and their ability to inspire trust and confidence

ISSQ-6 IS staff competence

Interpersonal quality of service provider  
Pilot people; show respect; pleasant to work with

Empathy  
Caring, individualized attention the service provider gives its customers

ISSQ-7 Communication with IS staff

Table 6.11 Mapping emergent ISSQ items into the extant measures of IS functions and SERVQUAL

In conclusion, the study suggests several dimensions of IS support that should not be overlooked if researchers and practitioners seek to assess the performance of IS support. Firstly, the IS support staff/group need to provide good service quality; hence, they should attach importance to responsiveness, assurance and empathy to the requirements of users. Secondly, reliable service with regard to regular system and infrastructure maintenance is also essential for users. Lastly, the quality, variety and flexibility of IS training are critical aspects of IS support in the context of ES. It is noted that user training and education consist of various contents and could be conducted in flexible forms. Regardless of formal training classes or informal on-the-job training, the ultimate goal is to provide users with access to implicit and/or explicit knowledge. Nevertheless, on-the-job training and communication constitute a key mechanism for retaining implicit knowledge carried by the individual user.
Chapter 7 Discussions

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7.1 Overview

Although there are various measurement approaches for gauging the success of IS artifacts, this study employs the perspective of subjective IS assessment. The purpose of the study is to identify the most appropriate subjective measures for the particular subject of evaluation, ‘Enterprise Systems’ and for the particular context, ‘Chinese organizations’. This chapter attempts to demonstrate the extent to which the research findings satisfy the targeted study goals and how validly those findings have been addressed. The study adopts a general inductive research design and a qualitative-based survey. Having questioned 144 Chinese ES users in terms of their experience and awareness of ES and the impacts of ES, an emergent and contextualized IS evaluation model, the Mandarin version IS-Impact model, has been developed. In this discussion chapter, we firstly compare the contextualized Mandarin model to the original IS-Impact model proposed by (Gable, Sedera et al. 2008). The assumption underlying the comparison between the two versions of models is that: a high level of similarity manifested between the two models is indicative of the validity of the emergent model; this assumption works from the basis that the referenced Gable et al. ’s model in the comparison is the most rigorously empirically validated and theoretically sound measurement model in the IS effectiveness/success research stream (Ifinfedo 2006; Petter, DeLone et al. 2008).

The third section of the discussion will focus on the contextualized measures in the Mandarin IS-Impact model. Drawing on a triangulation of multiple sources of evidence, the researcher will demonstrate how the contextualized IS-Impact model addresses the needs, the gaps, and the uniqueness of IS evaluations in the Chinese context. Based on previous discussions and convergent interpretations, several arguments regarding the IS effectiveness in China will subsequently be proposed.

The fourth section of the chapter is the final discussion that attempts to harmonize the emergent constructs and the IS-Impact model. With the central interest of assessing the effectiveness of enterprise systems, the researcher
proposes two hypothesized models to interpret the study findings. Firstly, drawing on prior literature and the discussion made in the previous sections, we propose a causal model that represents a set of hypothesized causality between the IS-Impact measurement model and these two emergent categories: User Quality and IS Support Quality. Secondly, this final discussion is going to examine the emergent constructs from the perspective of Alter’s Work System theory. The researcher explores the extent to which Work System Theory can inform evaluations of enterprise systems. Drawing on the Theory of Work Systems, the research will demonstrate that the emergent Mandarin version IS-Impact model, plus a new dimension of user quality, other than the original four, can capture an overall picture of IS effectiveness.

7.2 The contextualized Mandarin version IS-Impact model

The identification of the appropriate dimensions and measures of IS-Impact in the Chinese context is given the highest priority in this study. As discussed in previous chapters, the identification of the contextualized Mandarin version IS-Impact model was the biggest challenge and the most important contribution of this study. Since there are no prior studies that adequately investigate the IS evaluation in this specific context, the researcher employed the identification survey to inductively identify the contextualized dimensions and measures of IS-Impact for the new context. Figure 7.1 presents the contextual Mandarin version IS-Impact model.
As with the existing theory of IS-Impact, the contextualized Mandarin version IS-Impact measurement model comprises four dimensions, each of them defined as follows:

‘System Quality’: relates to the performance of the Enterprise System from a technical and design perspective. This dimension describes the 13 desirable characteristics of an Enterprise system from the perspective of the Chinese end-users.

‘Information Quality’ relates to the quality of the system output, namely, the quality of the information that the system produces in reports and on-screen. Six emerged measures (codes) pertaining to the dimension of Information Quality address the desirable characteristics of outputs produced by an Enterprise system from the perspectives of the Chinese end-users.

‘Individual impact’: related to a measure of the extent to which the ES has influenced the capability and effectiveness of individual employees, in the context of organizations. This dimension focuses on the relevant impacts on the immediate users of ES. Results of the identification survey indicate 7 measures pertaining to the dimension.

‘Organizational Impact’: related to a subjective measure of the extent to which the ES has promoted improvement in organizational results and
capabilities. This dimension consists of 12 observed ES impacts that the Chinese ES users had been aware of.

We recognize the commonality between two versions of IS-Impact model, especially at the dimension level of the contextualized model. These four dimensions correspond to the existing dimensions in the IS-Impact model (Gable, Sedera et al. 2008) and its predecessor the IS Success model (DeLone and McLean 1992). Having cautiously reflected on the study design and analysis process, the researcher has several comments on the strong commonality presented in these two versions of the model.

Firstly, we are confident in asserting that the rigorous research design and data analysis largely ensure the reliability and validity of the study process and results. Chapter 4 demonstrates the rationale of methodological choices for the study. Then, Chapter 5 describes very detailed practical applications of the research design and data treatments. Specifically, section 5.6 discusses the detailed process of the identification of contextualized dimensions and measures. Section 5.7 subsequently discusses the research effort that is used to strengthen the reliability of the identified measures and dimensions. Furthermore, section 5.8 elaborates the research effort used to strengthen the validity of the identified measures and dimensions. This structured and scientific study process ultimately aid in the trustworthiness of the study results. The research methods and the study design employed here provide a reliable solution to explore our research problems, and also help the researcher to establish reliable study results.

Secondly, the similarity at the higher conceptual level between the two versions of IS-Impact model suggests the goodness of the contextualized model. The original IS-Impact model is derived from the most important and well-established study in the IS-Impact study stream, and it is the most rigorously validated IS success model. Given this credibility, it is appropriate to arrive at the assumption that a good degree of similarity between the new model and the established model is a useful indication of the validity of the new model.
Thirdly, the similarity at the higher conceptual level between the two versions of IS-Impact model also suggests a good degree of generalizability in the initial theory. This study is a qualitative and exploratory study, proposing to investigate the phenomenon of IS-Impact in China and aiming to propose a contextualized IS evaluation model for Chinese ES adopters. In order to closely investigate the context, we employ a generally inductive study and inquiry approach. Given this specific study objective and research methodology, we are not able to maximally validate the generalizability of the existing theory, and nor was it our primary priority. However, the study finding, especially these grounded high level concepts of IS-Impact, are strongly supportive of the original IS-Impact model. The correspondence at the dimensional level between two models is a good indication of the external validity of the existing IS-Impact theory and model proposed by (Gable, Sedera et al. 2008). It suggests that the analytical power of the IS-Impact model can apply to the phenomenon of IS-Impact in different research contexts.

Finally, we also acknowledge that the commonality is also influenced by the research design, the theoretical underpinning that the study relies on, and the personal academic training and experiences received by the individual researcher. However, the researcher endeavours to attain a balance between any preconceived theoretical influence and the inductive research approach. The researcher cautiously reflects on this personal bias and the theoretical influences in chapter 4 and chapter 9.

In conclusion, the commonality at a high conceptual level between the two models does not diminish the overall contribution of this study; rather, it point to strengths of the study: a theoretically sound and fully contextualized Mandarin version IS-Impact model that is derived from the rigorous study design and process. The remainder of the section will continue to discuss the contextualized Mandarin version model. A complete comparison will be made at the measurement level between two models, then interpretations will be provided regarding the results of the model comparison.
7.2.1 The comparison with the extant IS evaluation frameworks

This section compares the contextualized Mandarin version IS-Impact model with the original IS-Impact model proposed by (Gable, Sedera et al. 2008). As mentioned in Chapter 1, the global IS-Impact model is employed as a judgement reference, through a comparison between these two models, we are able to conclude the appropriateness of the contextualized IS-Impact model for the specific Chinese context. This comparison is conducted at the measure level across two models. The authors of the original model suggest that any further research in extending their work should employ their 37 ‘item pool’. Heeding their suggestion, the author compared the emergent 38 items of the Mandarin IS-Impact model with the 37 ‘item pool’. Figure 7.2 illustrates the associations between the Mandarin version model and the original model. Key observations are also explicated regarding the mapping results between these two versions of models.

The primary purpose of the comparison between the two models is to further suggest the validity of the emergent measures grounded in the identification survey. Given that the original IS-Impact model is the most important and well-established study in the IS impact study stream, it was appropriate to employ the original IS-Impact model as the judgement reference against which we test the validity of the newly acquired research findings in the same study stream. Furthermore, the comparison between two versions of the IS-Impact model would bring any difference in the IS-Impact phenomenon between two contexts to the surface, providing readers with an in-depth understanding of the IS-Impact.
Figure 7.2 shows that, in the Mandarin version IS-Impact model, 26 (68%) out of the 38 measures are found to be associated with 30 items in the global IS-Impact model, while 12 further measures, more attached to unique and contextual issues of the Chinese IS-Impact phenomenon, also emerged from the study. Specific to each dimension in the contextualized model, 11 of 13 System Quality, 3 of 7 Individual measures, 6 of 12 Organizational measures,
and all 6 Information Quality measures are found relevant measures in the global IS-Impact model.

In the global model, of the 37 items available, 30 (81%) measures are instantiated in the Chinese context, and 7 (19%) measures are not instantiated in the new context. These missing measures are ‘Organizational costs’, ‘E-government’ in the dimension of ‘Organizational Impacts’; ‘Importance’, ‘Understandability’, ‘Conciseness’ and ‘Uniqueness’ in the dimension of ‘Information Quality’, and ‘data currency’ in the dimension of ‘System Quality’. It is noted that the items of the dimension ‘Individual Impacts’ are fully instantiated. Both the dimension ‘System Quality’ and the dimension ‘Organizational Impacts’ are instantiated to some extent. However, the dimension ‘Information Quality’ is not well instantiated in the Chinese context. The original IS-Impact model with its 37 ‘measure pool’ is also shown in figure 7.2, where the 30 instantiated measures are highlighted in Black text.

In addition, there are some further interesting observations worthy of mention.

- Most newly identified measures relate to the ‘impacts’ half of the IS-Impact model. 4 new measures are proposed for Individual Impacts and 6 new measures are proposed for Organizational Impacts in a Chinese context.

- Among the co-occurring measures, most of them found a singular correspondent measure in the global model. The association between the matched items is illustrated by a single arrow in Figure 7.2.

- Some measures in the Mandarin version model relate to multiple measures in the global model. For example, the item ‘system features and functions’ correspond to ‘user requirement’ and ‘system feature’ in the global model. Another example is the ‘cost reduction’ in the Mandarin model, which is related to the original measures of ‘cost reduction’ and ‘staff requirement’.

- Measures in the original model relate to multiple measures in the Mandarin model. For example, ‘customization’ in the original model corresponds to ‘system configuration’ and ‘system extendibility’ in the Mandarin model.
Some associations between these two models cross boundaries of dimensions. For example, ‘information trustworthiness’ in Information Quality relates to ‘data accuracy’ in the dimension System Quality in the original model. Or, the Organizational Impact item ‘information transparency’ finds association with the item ‘assess’ which occurs in the dimension SQ in the original model.

As with the prior discussion at the dimension level of the Mandarin model, a large number of co-occurring measures at the measurement level across both models are also indicative of the generalizability of the original IS-Impact model proposed by (Gable, Sedera et al. 2008). The strong comparison results suggest that the analytical power of the IS-Impact model can apply to the phenomenon of IS-Impact in different research contexts.

The focus of the study is to identify a contextualized IS-Impact model for Chinese organizations. Having employed an inductive inquiry approach and investigated within the new context, the researcher believes that this Mandarin version IS-Impact model is more appropriate to the Chinese context than its predecessor. These misfits and distinctions identified between the two models actually address differences in the IS-Impact phenomenon between China and western countries, and point out where scholars and practitioners should pay particular attentions when they assess Enterprise Systems in China. A later section will account in detail for how the Mandarin model addresses the uniqueness and contextualized issues in detail.

7.2.2 Reasons accounting for the difference between the two models

It is acknowledged that several issues might influence the identification of the Mandarin version model. We consider that the observed differences with relation to the IS-Impact across two models are attributed to: 1) the constitution of the sample of respondents; 2) the ES application that the study employed as the object of study; 3) the research methodology; 4) the research context. This section will elaborate on these possible issues which could have effects on the study findings.
• The profile of respondents

The distribution of our surveyed sample could be an issue affecting derivation of the contextualized Mandarin version model. According to the analysis of respondents in terms of the demographic data, most respondents come from low to medium levels in the organizational employment hierarchy: operational staff, operational managers, and business managers. As we were keen to solicit responses from end-users who have direct interactions with ES, we went beyond the scope of ‘business managers’ whom Shang and Seddon (2002) consider as the most suitable informants for an IS effectiveness study. However, our study findings corroborate Shang and Seddon’s comment on operational users that - operational staff and junior management tend to focus on ‘their individual needs and interest’ and ‘taking little account of organizational goals’. Chapter 5 reports that 22% of the overall size of citations relates to Individual Impacts, and 5 of 7 measures of Individual Impacts are concerned with individual users’ work processes and users’ work outcomes. Thus, this might be a reason why this study identifies more measures related to individual work effectiveness/productivity than the original IS-Impact model.

• The object of study

This study was conducted in a Chinese organization which had adopted an international ES product – the SAP R/3 system – rather than a local vendor’s ES products. The context research indicates the fact that as the international vendors attempt to transfer technology into a foreign context they are confronted with more severe misalignment issues than their local competitors. They need to conquer many challenges, such as culture barriers, software localization, function adaptations and/or redesign. Therefore, we consider that several measures presented in the ‘quality’ half of the contextualized IS-Impact model may be attributable to our study object. This study suggests that our respondents are aware of a distance between the international ES applications and the local users’ needs. They especially commented on the quality of software translation, function-task fit and software configurability, and features of reports; namely, several aspects of software localization that were
strategically important to the international ES vendors. The researcher will discuss this issue in detail in the later section 7.3.1.

Compared to the Gable et al. (2008) study, this study goes beyond the module of ES financials, expanding the investigation to the overall ES application (SAP R/3) installed in the participating company, which includes 10 ES modules and 5 major business functionalities. As the survey instrument explains that the study is concerned with ‘the SAP application’ rather than any single module, our instrument design effectively helps respondents to take a broader perspective and to reflect on the whole ES. We observed that, having been assisted with a carefully designed instrument, many respondents were able to think beyond their own functionality and individual interests, giving an account of organizational issues related to their ES. Further, as indicated in Chapter 5, most of the respondents needed to use multiple modules (an average of 1.9 modules), and to carry out tasks crossing traditional function boundaries. These working phenomena made it easier for them to take a process-oriented perspective, and to relate to issues such as data integration, organization harmonization, functionality cooperation and business transparency. Thus, we identify several new measures in the dimension of organizational impacts in this study, which relate to these above issues. The researcher will also discuss these new issues in detail in later sections.

- The research methodology

The researcher also acknowledges that the employed research methodology has impacted on the analysis results. The data collection instrument we used, the data we gathered, the analysis methods we adopted, all give rise to the ultimate study results. The generally inductive approach assists the researcher to closely investigate the context. The open-coding techniques, constant comparing analysis, and microanalysis, referenced to the Grounded Theory Method, help the researcher to be theoretically sensitive to the textual data as well as stay open to any theoretically possibility that might be grounded from the data. Our cautious decisions and selections of research methods and techniques, which have been discussed in Chapter 4 and 5, allow the study to identify new
contextualized measures that a deductive method might not allow the researcher to find out.

- The research context

Finally, we consider that the research context is a most important issue that influenced the study results – the contextualized Mandarin version IS-Impact model.

As stated in Chapter 2, this study is context-dependent research which moves the object of investigation beyond the previous research setting into a new context. This study is also a context-specific study, with particular interest in the uniqueness and difference of the study object when it is considered in the new context. Hence, context is a particularly interesting factor in this IS evaluation criteria study and we believe that a great many variations of research findings can be ascribed to context. The subsequent section will give a detailed account of the possible influence of the Chinese context on the study results. The implications of these contextualized measures for the Chinese context will be also elaborated in this section.

7.3 Implications of the contextualized Mandarin version IS-Impact model

The study proposes to gauge IS success in the Chinese context. A contextualized Mandarin version IS-Impact model is then developed to aid in the assessment of IS success in China. This section will delineate the implications of the Mandarin version IS-Impact model for the Chinese context. Meanwhile, as we consider that the distinctiveness of Chinese context is one of the major issues contributes to the identification of the Mandarin model, this section will also present an extended discussion on possible contextual explanations for these distinct measures of the Mandarin model. This section will triangulate findings within this study, namely, collaborating findings and propositions identified in the early context study and study results in the later empirical identification survey. ‘Triangulation’ often refers to the
use of multiple methods in the examination of a study object (Gable 1994; Jonsen and Jehn 2009). The notion of triangulation is normally related to a research design, especially in the case of a design combining both qualitative and quantitative methods (Gable 1994; Gable 1996). Here, triangulation is related to the analysis, the comparison and the convergence of findings and evidence from diverse sources and study phases.

The triangulation of analysis has a twofold purpose. Firstly, it serves as an approach to strengthening the internal validity and interpretation of the contextualized Mandarin version IS-Impact model. The essential assumption is that the validity of study findings is enhanced when two or more types of study inquiries that have offsetting biases are used to assess a given phenomenon, and the results converge or corroborate (Jonsen and Jehn 2009). Eisenhardt (1989) also advocates this approach, noting: ‘Overall, tying the emergent theory to existing literature enhances the internal validity, generalizability, and theoretical level of theory building from case study research (p. 545)’. Thus, when results from both the context study and the identification survey can corroborate and support each other, the robustness and trustworthiness of the study are demonstrated. Secondly, the triangulation of the research results reveals a much broader picture of Chinese ES effectiveness than a study of a particular case can render. The contextual richness offered by the context study just complements the close scrutinizing of the specific case investigated by the identification study. Therefore, the convergence of evidence and interpretations will enrich understanding of the phenomenon of ES effectiveness in China.

Cross-reference tables are utilized to present the triangulations across several sources of evidence and study results: identified IS-Impact measures, empirical evidence from the identification survey, and related context research findings that support the empirical findings. The cross-reference tables highlight contextualized IS-Impact measures identified in the study, which are strongly supported by both empirical field study and previous literatures review. The associations among multiple evidences explicate the applicability of those measures and also demonstrate the validity of the contextual IS-Impact evaluation model. Furthermore, drawing on the discussion of contextualized
IS-Impact measures, some important implications of this Mandarin model are brought forward finally.

It is noted that the supportive evidence for each contextualized measures can be either positive or negative. The convergence of very different perspectives are valuable, since they mirror each other and aid in a rich interpretation and understanding of the IS success phenomenon in China. Specifically, most evidences identified in the context study are negative perspectives and they point to the emergence of package-context misalignment issues that have been observed by previous studies. It is assumed that the misalignment problems between an ES and the adoptive organization would have presented if IS managers failed to manage those critical issues which are watched out by these IS-Impact measures.

Though context research indicates that inappropriate management of ES would results in the emergence of package-context misalignment problems, the identification survey empirically demonstrates that effective management of ES would lead to a successful ES adoption and enable organizational changes in a positive way in the PETRO. Co. The identification survey manifests several essential benefits that Chinese organizations will realize through effectively using the adopted ES. The case of PETRO supports the significance of the contextualized IS-Impact measures by providing us positive evidences.

In summary, the Chinese organizations confront the coexistence of risks and opportunities when they adopt ES applications. The contextualized IS-Impact model will facilitate Chinese IS practitioners to manage possible risks with relation to the ES misalignments as well as to gauge positive impacts that the ES has yielded.

7.3.1 Implications of the ‘quality half’ of IS-Impact model for the Chinese context

The ES package provides a generic solution with purported ‘best business practices’ that dictates how a company structures its organizations, production and management (Sathish and Pan 2007). The ‘best business practice’ prescribes for adoptive organizations a procedural vision and means for segmenting, organizing and carrying out work in contemporary enterprise
settings (Kallinikos 2004). These procedural and segmented works are then pre-packed and codified as data, processes, and transactions within and across functions of an organization. However, the pre-packaged features and technical designs might not meet unique requirements or fit into a particular context.

Soh, Kien et al. (2000) and Hong and Kim (2002) examine the ‘misfit’ issue in relation to the technical design of software application, identifying four types of misfits including data schema, process, system output and user interface design. Evidence from the Chinese ES adoption literature confirms the misfits coming from technical design hindering the effective usage of ES applications by Chinese adopters. Corresponding to the phenomenon identified in the extant literature, several IS-Impact measures developed in the I-survey also address the importance of this issue. Table 7.1 presents the contextualized IS-Impact measures with relation to the aspect of ES quality. Relevant evidence found in two sources is also mapped into each measure.

<table>
<thead>
<tr>
<th>Contextualized IS-Impact measures</th>
<th>Supportive evidence found in context research</th>
<th>Examples/Empirical evidence in PETRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>• SQ-9 System accuracy</td>
<td>• Data misfit</td>
<td>• Examples</td>
</tr>
<tr>
<td>The measure depicts the degree of congruency between what the user wants or requires and what is provided by the ES. Data misfits can cause inaccuracy in the system, such as currency, time and date formatting, measurement, and numeric format, etc.</td>
<td>Data misfits point to incompatibility in terms of data format and relationships among entities as represented in the underlying data model</td>
<td>A respondent reports a system bug due to the underlying data model of SAP R/3. He said that Chinese names or terms go beyond the defined number of characters in data fields in the SAP system. It causes lot of trouble whenever they need to process transactions related to the client (No.67)</td>
</tr>
<tr>
<td>• SQ-1 System features</td>
<td>• Process or functional misfits</td>
<td>• Empirical evidence</td>
</tr>
<tr>
<td></td>
<td></td>
<td>41 citations relate to system</td>
</tr>
</tbody>
</table>
System features describes the extent to which the ES provide useful features to meet a user’s requirement. Process or functional misfits arise from incompatibilities between organizational requirements and ES packages in terms of the processing procedures required. A large number of respondents commented that basic requirements were satisfied currently. However, it is necessary to make further improvements to strengthen the technical-task fit. Besides, some respondents pointed to specific area they expected to be realized or improved in the future.

- **SQ-7 System sophistication**
  This measure generally refers to the elegance and clarity of a system design by which the interaction with the system is more efficient. The measure includes the goodness of user interface design.

- **SQ-12 System translation**
  This measure relates to localizing an ES with the appropriate local language when the ES was introduced to users in overseas.

- **IQ-3 Report usefulness**
  The extent to which the content of the report are useful, relevant and

- **System interface misfit**
  Interface misfits arise from incompatibilities between organizational requirement and the ES package in terms of user interface design, including both language and content aspects.

- **Empirical evidence**
  PETRO’s ES users were aware of the usability of the system interface design. 5 of 11 citations praise SAP interface as ‘user-friendly’.

- **Examples**
  Evidence in PETRO indicates not all local employees will feel comfortable in a multi-linguistic system setting. A respondent commented that some user interface is ill designed. For example, most employee of PETRO are Chinese, so Chinese should be the first language option in the system (No.114.424).

- **output misfit**
  Output misfits arise from incompatibilities between organizational requirement and the ES package in term

- **Empirical evidence**
  The survey in PETRO reveals an output misfit occurring in the company. Users in the Financial department report
innovative to users and fulfil a user’s task.

- **IQ-4 Report usability**
  the report can be put into use directly

- **IQ-5 Report format**
  The extent to which the presentation of reports is readable, clear and well-formatted.

| **of presentation format, information content in the system output.** |
| **An Output misfit is especially severe in a Chinese context, since the Chinese implement a distinct financial and tax reporting system.** |
| **poor usability and format design of the reports produced by the SAP system.** |

Table 7.1 The ES quality-related contextualized measures

Table 7.1 indicates how the contextualized IS-Impact model addresses the package-context misalignment issue. Our assumption is that scoring on specific measures can inform evaluators of the extent to which the ES being evaluated is technically adapted and applicable to this local market. For instance, in the contextualized IS-Impact model, the measure of **SQ-9 System accuracy** can account for the data misfit issue. Data misfits can cause inaccuracy in the system, such as currency, time and date formatting, measurement and numeric format, etc. A high score on ‘system accuracy’ might indicate the ES being evaluated is free from the problem of data misfits.

Further, three measures in the dimension of System Quality, consisting of **SQ-1 System features, SQ-5 System configuration, and SQ-8 System Extendibility** can account for process or function misfits. The former two measures describe the extent to which the ES provides appropriate contextualized ES features and configuration alternatives to meet a user’s requirements. The third measure addresses the ability of system customization, expansion and modification, which is essential for ES to deliver constant benefit for adopters and to keep alignment with the Chinese adopter’s corporation strategy, such as enterprise expansion and acquisition. Thus, it is
assumed that high scores on these measures imply good alignment between a user’s requirements and the ES functions at that time as well as in the future.

Also, 3 report-related measures, incorporated in the dimension of Information Quality can account for this particular misfit issue. These 3 measures, including **IQ-3 Report usefulness**, **IQ-4 Report usability** and **IQ-5 Report format** address the congruency between the Chinese user’s expectation and the ES embedded features in terms of reports and other information outputs. The evaluator can expect high scores on those measures if the ES being evaluated is producing information products meeting local users’ requirements.

Last but not least, two measures in the dimension of System Quality account for the goodness of interface-related design. On the one hand, **SQ-12 System translation** intends to measure the extent to which the ES was appropriately translated into the local language when the ES was introduced to this overseas market. On the other hand, **SQ-7 System sophistication** addresses the goodness of user interface design. Therefore, a high score on these two measures might be indicative of user-friendly design and appropriate translation of the system interface.

In a summary, the misfit due to software technical design implies much needed improvements or adaption of the software features for the specific context. A low level software contextualization would possibly cause misfits between the ES application and the requirements of the ES users. Thus, when it comes to assessing goodness and effectiveness of ES applications in this particular context, the evaluator would consider evaluating the goodness of the contextualization of the software features and technical designs, or investigating how well this contextualization meets specific business needs of the local market.

**Implication 1 – Enterprise systems software should be fully localized and adapted to the requirements of new markets.**

It is worth noting that the package-context misalignments in terms of software design point to the issue of software localization. If an application has been
successfully used or marketed in one market or country, it may not be ready for others (Collins 2001). Therefore, software localization is the necessary process by which computer applications are analysed and adapted to the requirements of different markets. ES application vendor tend to take a ‘technical fix’ point of view (Swan, Newell et al. 1999), perceiving the technical artifacts as a fixed physical entity, and the design of such technology could (or may be) relatively independent of the context where they are used (Swan, Newell et al. 1999).

Against a background of economic globalization, accompanying the increased global communication and cooperation, people are becoming culturally homogeneous. Despite the trend, vendors should recognize that cultural/ethical differences are difficult to bridge, and there is an enduring need to tailor aspects of software to the unique requirements of markets or ethnic groups. Hence, the stereotypical view of a ‘technical fix’ should be avoided. Application developers should place emphasis on software localization that makes adequate adaptation, presenting flexibility and variations, and fulfilling specific needs for any single market (Collins 2001; Howcroft, Newell et al. 2004; Liang and Xue 2004).

Accordingly, this study argues that package-context misalignment is caused by inadequate software localization. The four types of technical misfit, ranging from the software’s underlying data model to reports/outputs embedded in the system, reflect various needs in terms of ES software localization in the Chinese market. For adequate software localization, vendors need to accumulate country-specific knowledge through market research as well as input from usability testing in the target country. Software localization needs to be conducted in both obvious and subtler aspects, in the national characteristics, including language, content, currency, time and data formats, measurements, formats, collating sequences, colour scheme, numeric formats, images and sounds, telecommunications infrastructure and navigational structure(Collins 2001). In line with the requirement of appropriate software localization, these relevant IS-Impact measures might be useful for both users and vendors, assessing the sufficiencies in light of ES product localization and adaptation to their particular context.
7.3.2 Implications of the ‘impact half’ of the IS-Impact model for the Chinese context

ES are promoted on the premise that they will drive strategically important organizational changes, streamline workflow, functionality and information flow, as well as increase productivity, reduce costs and improve decision quality and resource control (Howcroft, Newell et al. 2004). However, despite the promises and the continued popularity of ES, accumulated evidence demonstrates that obtaining the benefits from an ES is not as straightforward as those selling and promoting such systems would like us to believe.

A bulk of ES implementation studies has identified a list of issues that reflect a profound misalignment between ES packages and Chinese organizations in terms of management notions and style. They ascribe the poor fit between ES and the Chinese company to a fundamental incompatibility between the prescribed ES business model and traditional Chinese management systems. Drawing on preceding discussions on Chinese ES adoption reference, the context study in Chapter 3 synthesized several aspects representing the management model’s misalignment between Chinese organizations and ES applications.

Table 7.2 depicts the contextualized IS-impact items with relation to organizational management in Chinese companies. Those items indicate where the Enterprise Systems Applications will generate critical impacts on Chinese organizations. Table 7.2 also summarizes the differences and misalignments between the Chinese conventional management model and pre-packed business models in ES. Meanwhile, the table presents the IS-Impact measure in response to each misalignment issue. We have similar assumptions with these measures, namely, the higher the scores have given by users on these measures, the more the organizational and business benefits are from the ES being evaluated. The last column in Table 7.2 presents the empirical evidence in the identification survey that accounts for the IS-Impact measures identified.
<table>
<thead>
<tr>
<th>Corresponding IS-Impact measures</th>
<th>Supportive evidence found in context research</th>
<th>Examples/Empirical evidence in PETRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>• <strong>OI-2 Enterprise management optimization</strong></td>
<td><strong>Enterprise management</strong>&lt;br&gt;Chinese enterprise management style points to ‘low formalization, low decentralization and medium to low structural differentiation’. However, ES are employed on the premise that the enterprise is characterized as high formalization, high-to low decentralization and low structural differentiation.</td>
<td><strong>Empirical evidence</strong>&lt;br&gt;21 citations account for this organizational impact. Respondents commented that the SAP system ‘refined PETRO’s enterprise management and realizing enterprise management standardization and systemization in the company’&lt;br&gt;19 citations identified in the survey account for the item. The corporation’s functionalities were streamlined and coordinated as an integrated entity, sharing a mutual vision and moving toward common strategic goals. All departments communicate and network on an integrated platform. Business runs smoothly from one function to another</td>
</tr>
<tr>
<td>• <strong>OI-4 Enterprise integration/cooperation</strong></td>
<td><strong>Business transparency</strong>&lt;br&gt;</td>
<td><strong>Empirical evidence</strong></td>
</tr>
<tr>
<td>• <strong>OI-1 Information transparency</strong></td>
<td><strong>Business transparency</strong>&lt;br&gt;</td>
<td><strong>Empirical evidence</strong></td>
</tr>
</tbody>
</table>

\[6 \text{ ‘formalization’ defined as ‘the standardization of work processes and documentation’, (2) ‘structural differentiation’ defined as ‘the differences in goal orientation and in the formality of the structure of the organizational units’, and (3) ‘decentralization’ defined as ‘the extent to which power over decision-making in the organization is dispersed among its members’}(\text{Morton and Hu 2008})\]
This item attempts to examine the ease or difficulty with which the user who needs the information is able to get access to the information. The measure emphasizes the appropriate information authorization mechanism in the organization.

<table>
<thead>
<tr>
<th>Measure Description</th>
<th>Measure Details</th>
<th>Empirical Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>OI-3 Business process optimization</td>
<td>The misalignment issue arises from incompatible notions of information release, access, communication and transmission between traditional Chinese management model and ES prescribed model.</td>
<td>Of the 31 related citations, 27 citations praise the fact that SAP enhances information sharing and access. PETRO’s business and management become more transparent. The survey resulted in a clear awareness of the information authorization issue among the sample respondents.</td>
</tr>
<tr>
<td>OI-10 Automation</td>
<td>The misalignment issue arises from incompatible business processes and workflows between the organization’s business practices and ES prescribed standard business processes.</td>
<td>20 citations in the survey addressed the effect on the business process optimizations. PETRO implements a more accountable, standardized, transparent business process; some original boundary of functionalities has been eliminated or re-segmented.</td>
</tr>
<tr>
<td>OI-11 Business decision</td>
<td>The Chinese entrepreneurial model of strategy making relies on personal knowledge and intuition; ES facilitates better strategy making for business planning and decision making.</td>
<td>5 citations accounts for the item. On-line and real-time information enabled PETRO’s senior managers to make business decisions better.</td>
</tr>
</tbody>
</table>

- Business process

- Empirical evidence
marketing response; the extent to which ES facilitates rational and precise decision making of managers. | rational strategic decision making by providing timely, accurate and reliable data. | decisions based on accurate and consistent information. Meanwhile, the rapid access to performance-related information also enables forward-looking decisions.

- **OI-7 Business control**
  This measure intends to test the extent to which the ES facilitates stronger management control and reduces possible risks in organizations.

- **Business control**
  Chinese manager normally carry out a centralization government in the organization. ES applications enable a transparent and visible business process. Researchers argue the adoption of ES will strengthen centralization control over the enterprise.

- **Empirical evidence**
  9 citations solicited from the survey account for the issue. Respondents said that ES make a lot of hidden issues visible and strengthening the centralized control in PETRO.

### Table 7.2 The ES impact-related contextualized measures

**Implication 2 – The essential impacts of Enterprise Systems on Chinese organizations is ES-enabled change of Chinese conventional management practice and business model.**

Our proposition is that the most significant impact of ES is arguably the radical change of Chinese conventional management practices, facilitated by the ES inscribed business model, if the ES effectively integrates with the organization’s managerial and operational systems. In line with this argument, the study found supportive evidence through the identification survey, where the respondents were aware of significant effects of the SAP system with respect to the company’s management in the Chinese organization. 103 citations (64% of Organizational Impact citations) point to this issue. Specifically, respondents in the company commented on several management-related impacts which were enabled by the SAP system, including...
better information transparency, more rational business decisions, streamlined business processes and more centralized business control. Table 7.2 relates the supportive evidence found in the context study and the empirical evidence found in the fieldwork to IS-Impact measures accounting for each aspects of management model. The triangulation of multiple sources of evidence addresses the point that the adoption of ES applications is a powerful driver for Chinese organizations to redesign business models and business practices.

The convergence of results consolidates and cross-validates our argument that ES applications that have been appropriately implemented and used is an enabler of radical change in terms of enterprise management in China. ES can be a powerful driver to change management conventions, to enhance information transparency, to aid in data maintenance, to facilitate a rational decision making mechanism and to alter the organization-wide attitude towards organizational change, etc. Among these potential benefits the ES results, two of them manifest particular importance for Chinese organizations: information transparency and business process optimization.

- **Information transparency**

Dewett and Jones (2001) argue that two principal performance enhancing benefits of IT are information efficiencies and information synergies. Because of these two major benefits, the effect of IT increasingly extends to the realization of other organizational benefits, especially when IT is applied appropriately as a powerful addition to an organization’s communications infrastructure.

Information efficiencies are the cost and time saving result when IT allows individual employee to achieve a better task performance due to advances in the ability to gather and analyse information (Dewett and Jones 2001). Meanwhile, information synergies depict to effective performance gained when IT allow a group of individuals to pool their information, knowledge and resources and collaborate across their individual roles and functional boundaries, a ‘between-person or between-group effect’ (Dewett and Jones 2001).
It is clear that both information efficiencies and synergies are built upon a good organizational information access mechanism – a free and transparent access to necessary information is allowed and supported within the organization. The context study demonstrates that information transparency is not so obvious in Chinese business context. Chinese managers have different notions of information release, access, communication and transmission, compared to their western counterparts. Moreover, a misalignment between traditional Chinese management model and ES prescribed model regarding information access also notably signify the deficiency in realizing ‘information transparency’ related ES benefits.

The identification survey indicates that Chinese managers should change their mindset with respect to the information openness. Although lessening information access control has potentially negative effects or risks, a transparent business environment will ultimately promote organization productivity, given that a high level information efficiency and information synergies is attainable in this environment. The case of PETRO validates this argument, and both of the information efficiency and synergies are realized in this company. Information efficiency is manifested in multiple levels. Individual employees appraised that the ES-enabled information openness facilitates much effective data search, retrieval and analysis. The individual’s performance enhancements aggregately lead to an overall productivity in the organizational level. Furthermore, the information synergies manifests as the increase of boundary spanning for function knowledge and a smooth coordination and cooperation throughout the company. Information and knowledge transmitted via IT cut across personal and professional domains. Individual employees or subunits dramatically expand the access to various sources of information as well as increase their level of participation in various information networks. As a result of the applying ES as an effective information communication infrastructure, ES helps PETRO to attain improved enterprise integration finally.
• **Business process optimization**

The context research reveals the fact of the reluctance of conducting business process redesign when many Chinese organizations implemented their ES. Liang and Xue (2004) provides evidence in light of the difficulties of BPR in the Chinese ES adopters through their study of the success experiences of a top local ES vendor – UFIDA. They suggested that Chinese organizations attempts to implement and assimilate the ES software smoothly without rough disruptions. They opt for incremental transitions by using a few mild transforming strategies rather than dramatic organizational transformation.

Social shaping of technology perspective is useful to interpret the difficulties of Business Process Redesigning in China. Accordingly, the historical, cultural and political elements mutually play a significant role in shaping the design and implementation of technology. From this perspective, the ES applications, is the outcome of social processes in one particular cultural context. What embodied within an ES, is a set of practices, assumptions, values and rules, reflecting the requirements of this social context and vendor’s choices at the design stage (Grover, Teng et al. 1998) . Such technical and social choices have been stabilized after the software design and achieved ‘certain level of closure for changes’(Grover, Teng et al. 1998). However, ES is characterized as off-the-shelf software commodities (Shang and Seddon 2002); and the developments and implementations of ES are inevitably happened in different organizations. The separation between the constitution of an ES and the use of the ES in time and space underlies potential misfits and difficulties of any future actions that tend to eliminate the misfits.

For the organizations which are going to adopt an ES system, selecting a particular ES is the acceptance or at least a partial acceptance of this set of stabilized social elements embedded in the systems. The implementation of the ES require the adoptive organization must open the ‘black box’ of their own management and operation system, examine the consistency between two set of business rules, values and practices that embedded in two varied social entities. When misfits between two social entities are arisen, the organization has to
decide whether either to modify its existing structure, practice and rules to fit to
the ES application, or to customize the ES to fit to the existing social elements
of the organization. It is recognized that both solutions are costly and risky.
Revising the ES package amounts to an attempt to reverse the vendor’s choices,
leading to a new closure that embodies a different set of beliefs about how
things ought to be done in the user environment (Wang, Klein et al. 2006).
Resigning the stabilized business practice of the organization is to force the
organization to revise the existing outcome of social processes of negotiation
between complicated, heterogeneous networks of diverse stakeholders of the
organization (Wang, Klein et al. 2006).

The investigation of the Chinese national culture provides a rationale for the
Chinese management’s reluctance in terms of revising organizational business
process. (Zhao and Grimshaw 1992; Martinsons and Hempel 1998; Liang and
Xue 2004) argue that the discrepancy between these two cultures have
profound influence on IS adoptions. In general, Chinese society is based on
network of relationships and Chinese people are more likely to adapt to the
environment rather than to seek a scientific solution to alter the external
environment. The Chinese business culture is shaped by high context
communication (Martinsons and Westwood 1997) and individualistic
collectivist (Lu and Heng 2008). In this sense, the resistance of radical
organizational change and transformation is a natural response underlain by
Chinese cultures.

Meanwhile, the learning theory of organization is another indication of the
resistance of BPR, which posits the organizational memory have a dialectic
effect on organizational change, yielding counteracting forces, some promoting
the organizational change while others opposing it (Liang and Xue 2004). On
the one hand, new knowledge is always interpreted or understood in the context
of existing knowledge and can only be incorporated as sensible codification to
existing practices (Boudreau and Robey, 1996). In this sense, organization
memories facilitate organizational change. On the other hand, due to the
organizational memory, organizational members tend to be conservative to any
change, especially when the new knowledge is something that they are not familiar with or they can hardly related to the previous experiences.

Although both the national culture perspective and organizational learning theory provide rationales for advocating an incremental strategy of optimizing Chinese business process patiently, it is our contention that a radical change enabled by BPR and ES adoption are worthy.

Grover, Teng et al. (1998) argues that the business process reengineering is a critical intervening variable that mediates or moderates the relationships between IT investment and organizational productivity. It is necessary to recognize that the essential of the concept of reengineering is not ‘automation’ but ‘redesign’. According to our context study related to ES adoption in China, many of the early applications of IT in organizations focused on automating existing procedures. This approach may improve short-term operational efficiency but lead to limited far-reaching impacts in the organization.

Process automation and process redesign represent different depth of organizational change. Process automation is the least deep organizational change, whereas, the process redesign represents the most intensive transformation, involving technology, people and organizational practice. With the redesigning, the business process and workflow are re-examined and a totally new ways of conducting business will be implemented.

The Chinese IT management should realize that what really does matter is the extent to which the IT is effectively utilized in the organization, not the sheer amount of IT investment in that technology (Davenport 1993; Grover, Teng et al. 1998). Spending money on IT in automating inefficient processes will do little help until the processes are radically re-designed.

- **The possible influence of enterprise ownership**

Of note, PETRO, the study’s participating company, can be conceived of as a successful case of ES applications adoption, as PETRO’s users recognized that the company had benefited from ES in many aspects in their overall value chain. Most of the comments on the organizational level impacts are positive and encouraging. It is also worthwhile to note that the respondents were not
aware of obvious conflicts between PETRO’s work practices and ES-inscribed work practices. PETRO did not experience severe pain to reshape previous work practices and to remove the memory of old business processes, in order to make a shift to the ES business platform. One of the possible reasons for the successful adoption of ES might be the enterprise ownership of the company. Prior studies argue that enterprise ownership is a unique contextual factor in China, as a variety of ownership structures can be found in China side-by-side. It is already recognized that ES implementation and/or usage results vary among firms with different ownership characteristics (Martinsons 2004; Yusuf, Gunasekaran et al. 2006; Ma and Loeh 2007; Ge and Voss 2009). Non-SOE organizations tend to report a better chance of success than SOE businesses. In accordance with prior studies, the company of PETRO, as a Non-SOE business venture, presents a generally successful case with regard to ES adoption. The case of PETRO indicates a better degree of compatibility between a Chinese non-SOE firm and the ES application in terms of organizational structures and/or work practices. The non-SOE, especially foreign-owned or investment business, implements a business model that is much closer to the ‘best practice’ inscribed by the ES applications, because both find origins in the same business and culture context, reflecting a similar social value and conventions.

The case of PETRO indicates the importance of organizational fit in ES effectiveness. The advent of package-context misalignments issue is an indication that there is a much longer distance between Chinese business model and ES-embedded model than the case in western countries. If dealing with the misalignment gaps were not easy for the ES practitioners in the West, it would be more difficult for Chinese managers to tackle this issue. It is the responsibility of both ES adopters and ES vendors to seek avenues to achieve a result of better package-context alignment. As for the particular case in China, it is more crucial for Chinese entrepreneurs to recognize that to take the best advantage of ES they need to manage balanced change to the existing processes and Enterprise Systems; and, furthermore, they need to initiate effective organizational learning with ES. Similar comments are also made by (Shang
and Seddon’s research on ES benefits, where they discuss the balanced effort in retaining existing intelligence with the new influences from the ES.

7.3.3 Implications of the emergent categories for the Chinese context

In the context study, the study revealed an implicit gap between ES software and the Chinese market due to the technical complexity of ES and the immaturity of Chinese organizations in terms of using technology. Researchers and practitioners should acknowledge that China is still in the midst of development. Information technology has still not reached its final development stage compared to developed countries (Ge and Voss 2009). According to surveys in extant studies, data quality, technical complexity, high price and massive IT human resource demands were perceived as obstacles hampering Chinese organizations from adoption ES systems (Ping and Grimshaw 1992; Shue, Chae et al. 2004; Zhang, Lee et al. 2005; Yusuf, Gunasekaran et al. 2006). Currently, many companies can effectively allocate a large budget for purchasing ES software and related hardware, and technical issues can be easily resolved by outsourcing external technology expertise. However, some intangible and more subtle issues have been underestimated and ignored by Chinese adopters, such as a longer preparation for business process redesign (Newman and Zhao 2008), more time for data cleansing and transferring (Shanks, Parr et al. 2000), more training efforts required in the overall lifecycle of an ERP project (Zhang, Cecez-Kecmanovic et al. 2008), more effort on improving competence of both end-users and IT support staff.

In line with the observations made by preceding studies, we argue that, in order to make full advantage of ES applications, it is imperative for Chinese adopters to spend effort on the development of complementary competence and resources that the ES application would demand. Among the necessary complements to the ES artifact, the quality of the ES user and the quality of ES support/service are very essential. It is interesting to see that both the context study and field work are consistent on this issue. Table 7.3 presents triangulation of relevant IS-Impact measures, empirical evidence found in the fieldwork, and supportive evidence found in the context study. The
convergence of multiple sources of evidence addresses the importance of the ES complementary competence and resources while implementing an ES in Chinese organizations.

<table>
<thead>
<tr>
<th>Corresponding IS-Impact measures</th>
<th>Supportive evidence found in context research</th>
<th>Examples/Empirical evidence in PETRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>• IQ-1 information availability</td>
<td>• Data accuracy and trustworthiness</td>
<td>• Empirical evidence</td>
</tr>
<tr>
<td>The measure depicts the extent to which the information from the system was complete and comprehensive.</td>
<td>Data accuracy is not a given in Chinese organizations. The quality of data influences both ES implementation and ES stabilization.</td>
<td>Of the 17 citations related to the issue, most of the comments praised the fact that the SAP system contributes to the enhancement of the comprehensiveness of the data.</td>
</tr>
<tr>
<td>• IQ-6 Information trustworthy</td>
<td></td>
<td>Users in PETRO were aware that the shared database and data schema eliminates the problem of data inconsistency. The encoded rules of information authorization and control reduce human intervention and tampering with data.</td>
</tr>
<tr>
<td>The measure intends to gauge the extent to which information is trusted or highly regarded in terms of their source or content.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• The construct of User Quality</td>
<td>• Quality of ES End-user</td>
<td>• Empirical evidence</td>
</tr>
<tr>
<td>An emergent dimension in the study is related to user quality. We argue that competent ES users should exhibit three essential competences in terms of utilizing ES: ES-related knowledge, ES-related skill and</td>
<td>It is a long-term strategy for Chinese organizations to establish a learning mechanism to gain competent end users, to encourage appropriate usage and to transfer the knowledge from proficient user to novel users in Chinese ES adoptive</td>
<td>The survey in PETRO yielded 42 (7%) citations accounting for various issues of ES users’ quality. The survey reveals that users with good command of system knowledge, skills and a sense of system acceptance and value are critical complements to the ES (SAP</td>
</tr>
</tbody>
</table>
acknowledgement of ES value. Thus, this dimension attempts to evaluate a user’s quality from these aspects. A company. R/3) implemented company. However, we found that end user competence is one of the issues impeding the intensive deployment of SAP system in the company.

- The construct of IS Support Quality
An emergent dimension in the study is related to the quality of the IS functions’ support and service. Excellent IT service and support facilitates organizations to extract benefits from their IT investment and to obtain IT flexibility and capability.

9 measures associated with IT function support were emerged through the Identification survey, suggesting measuring external and internal IS support from multiple perspectives.

- Quality of ES support
Given that most Chinese organizations lack experience in dealing with complicated Enterprise IT products, they need more competent IT professionals, from both internal and external IT groups, to provide them with a variety of support and excellent service.

- Empirical evidence
The survey in PETRO yielded 49 (8%) citations accounting for various issues of IS Support Quality. IS/IT support functions is one of the important organizational facilitator to amplify the positive impacts of ES. The survey reveals that PETRO did not attach importance to the quality and competence of IT functions. Respondents addressed their expectations in terms of excellent service and support from both internal IT staff and outside IT experts.

| Table 7.3 The contextualized measure with relation to two emergent categories |
|---|---|---|
| The construct of IS Support Quality | Quality of ES support | Empirical evidence |
| An emergent dimension in the study is related to the quality of the IS functions’ support and service. Excellent IT service and support facilitates organizations to extract benefits from their IT investment and to obtain IT flexibility and capability. | Given that most Chinese organizations lack experience in dealing with complicated Enterprise IT products, they need more competent IT professionals, from both internal and external IT groups, to provide them with a variety of support and excellent service. | The survey in PETRO yielded 49 (8%) citations accounting for various issues of IS Support Quality. IS/IT support functions is one of the important organizational facilitator to amplify the positive impacts of ES. The survey reveals that PETRO did not attach importance to the quality and competence of IT functions. Respondents addressed their expectations in terms of excellent service and support from both internal IT staff and outside IT experts. |

Table 7.3 depicts the IS-impact items with relation to the IT maturity gaps and misalignments manifested in the context study. The convergence of multiple source of evidence supports our argument in terms of a joint effort in implementing both ES and ES complements being essential to the Chinese ES
adopter. Table 7.3 presents IS-Impact measures in response to difficulties confronting Chinese ES adopters in relation to IT expertise and maturity. Here, we have similar assumptions with respect to these measures, namely, the higher the scores given by users on these measures, the less trouble does the company experience in these issues. For instance, the particular information quality measures – information availability and information trustworthiness, account for improved data accuracy. A user scoring high on these measures suggests improved data accuracy. The last column presents the empirical evidence from the identification survey that accounts for the necessary ES complements implied by PETRO’s survey respondents. The sub-sections below will elaborate the latter two research findings by associating three sources of evidence in the study. Of note, a discussion of improved data quality was presented in section 6.4.2, following the descriptive accounts of the dimension of Information Quality.

**Implication 3: User quality is a critical driver to acquiring ES effectiveness in the post-ES implementation stage**

Users have an important role in the eventual success of IS (Sabherwal, Jeyaraj et al. 2006). Researchers from two other mature and rich IS research streams-IT adoption and IS effectiveness, contend that the attributes of users, such as users’ experiences, attitudes, expectations and participation regarding particular IS and/or general IS applications will influence IS adoption and IS post-adoptive deployment significantly (Venkatesh 2000; Venkatesh, Morris et al. 2003; Jasperson, Carter et al. 2005; Sabherwal, Jeyaraj et al. 2006). Also, researchers who have a focused interest in IT end-users argue that there is a close connection between end-user computing competence and the performance of individuals, groups and the overall organization (Malhotra and Galletta 2004; Yoon 2008; Ng and Kim 2009; Yoon 2009).

The fieldwork in this study provides empirical support for the abovementioned theoretical arguments of prior researchers. More specifically, the identification survey explicates three types of user quality by which the individual user would exert impacts on Enterprise Systems utilization and eventual effectiveness.
Drawing on the Identification survey and discussions from previous studies, the researcher argues that User Quality is a critical driver to acquiring ES effectiveness in the post-ES implementation stage. Organizations striving for a sustained competitive edge through continuous deployment of ES should pay attention to the development of knowledge, skills and favourable attitudes of end users.

- **Discussion on knowledge-based user quality**

ES Users should possess sufficient knowledge of ES functions that relate to their job role. Sufficiency refers to both depth and breadth of system knowledge. The survey in PETRO revealed a rather constrained breadth of system knowledge that PETRO’s employees currently have. A number of respondents expressed their worries about their limited knowledge of the SAP system, and were aware that a large number of functions of ES might be useful to their work but they had no idea how to incorporate them into their work.

Some respondent further noticed that the narrow knowledge domain possessed by a SAP user will impede the smoothness and effectiveness of an integrated process-oriented system. The embedded logic within the enterprise system dictates an integrated view of the business process, emphasizing seamless cooperation and coordination across functions. Working in an ES-enabled business process, users have to adopt an expansive view of their job role and possess business and/or system knowledge spanning the overall workflow. Therefore, it is meaningful to stress the necessity to broaden the knowledge domain of ES users. Organizations should tailor particular training program according to the specific needs of users, and facilitate their access to the knowledge demanded by their job role.

- **Discussion on Skill-based user quality**

ES users should be proficient with the system. According to learning theory, the acquisition of proficiency is an evolving process. Individual proficiency will be gradually strengthened as more experience is gained through a regular interaction with the focal object. Different people will possess different levels of skills and proficiencies depending on their prior experience, habits and
personal traits related to IS use (Agarwal and Prasad 1998; Jasperson, Carter et al. 2005). A beginner or novice user of an ES may operate the system quite clumsily, following the user manual step by step, requiring a considerable time to finish a task. After using the same function a while, an experienced user can speed up performance by moving beyond the step-by-step process into more fluid and efficient processing. Moreover, some users who are not satisfied with their present level of ES use may seek to advance their exploration of the system functions and expand the currently available features of ES. In some more mandatory system usage environments, users have to come up with creative ES usage or mobilize existing system knowledge when confronting difficult and novel tasks. These latter two situations require advanced system skills of the users compared to the former situations.

The case in PETRO suggested ES users in the company possessing an uneven level of skills. The level of system skills is related to the years of experience with the SAP system and years of service in the company. Large numbers of end users who have a comparatively short duration in PETRO possess only basic skills, satisfying simple routine task. Few of them have an advanced level of skill and are able to act creatively with the system when emergency arise. Some key users, so-called super users, are those who have a longer duration in the company and participating in the SAP implementation, possess higher level expertise of both business processes and the SAP technology. PETRO’s respondents consider the turnover of highly-proficient super users hinders the effective usage of ES and performance.

The perspective of knowledge transferring in social network theory is useful to interpret the negative consequences of uneven levels of system proficiency and the loss of super users in PETRO. This perspective suggests how IS proficiency is situated within a social network and may be important for how information systems can be leveraged for performance outcomes (Kane 2007). If IS proficiency and skill is centralized on key nodes- those who are positioned as the core in the social network and are associated with a number of information benefits (Burt 1992; Kane 2007), this centrality of IS proficiency will significantly influence the IS use and IS impacts in the social network.
Accordingly, the situation of uneven levels of proficiency in PETRO reflects the notion of ‘centrality’ in social network theory. Those super users referred to by respondents are central nodes in the working and social network of the PETRO company. They possess advanced IS proficiencies and are situated in critical positions which are well positioned to disseminate obtained IS proficiencies, and to identify and access new source of IS proficiency. The loss of super users equate to the loss of important IS proficiencies at PETRO. The overall function of knowledge acquisition and dissemination would also be handicapped because of the loss of the central node in the knowledge transferring network.

- Discussion on Attitude-based user quality

The researcher argues the attitude-based user quality is another key aspect of competence that the ES user should possess in the context of ES usage. This study defined ‘attitude-based user quality’ as a measure that estimates acknowledgement, attitude, a sense of value, and adaptability in the interaction with Enterprise System. Earlier studies suggest that the user’s attitude has a strong relationship with individual IS acceptance and overall IS success (Venkatesh, Morris et al. 2003; Sabherwal, Jeyaraj et al. 2006)

Previous Chinese ES adoption literature indicates that organizations tend to ignore user education in terms of IS acceptance and attitudes towards IS. The context study suggested that ‘In Chinese organizations where there is a lack of the necessary learning and changing environment, resistance to the ES (ERP) is implicit yet hard to define’ (Zhang, Cecez-Kecmanovic et al. 2008). In many cases, the implementation of ES is imposed by a centralized administration system or the headquarters of a large Chinese business group. Compliance made Chinese user nominally support a project, but, in fact, they did not recognize the value of the ES nor feel comfortable with the change brought about by the system. This implicit resistance will eventually result in an ineffective training program, data of poor quality, miscommunication between users and IT experts, an inappropriate system configuration, and misalignment between user requirements and the software. All this accumulated passive
attitude and overt or covert resistance will result in a failure situation (Yusuf, Gunasekaran et al. 2006; Avison and Malaurent 2007; Zhang, Cecez-Kecmanovic et al. 2008).

The specific case of PETRO also reveals implicit resistance in the company, evidence manifesting itself in relation to refusal to adhere to system dictated processes and difficulties in system updates and reconfiguration. Thus, developing more favourable user attitudes toward ES and IT in general is imperative to many Chinese organizations who strive for further business benefits from their ES investment. Organizations should implement a long-term IT management strategy of promoting users’ positive attitude and cognitions. This effort in promoting users’ attitude-based quality would pay off as improved individual performance and organizational productivity.

Ineffectiveness in the post-ES implementation management is a critical issue perplexing many organizations which strive to realize promising ES benefits (Davenport 1998; Davenport 2000; Ross and Vitale 2000; Shang and Seddon 2002). Available evidence suggests that the functional potential of these installed IT applications is underutilized. Most IT users apply a narrow band of features, operate at low levels of feature use, and rarely initiate extensions of the available features (Jasperson, Carter et al. 2005; Sun and Zhang 2008). The identification survey confirmed (Jasperson, Carter et al. 2005)’s argument that ‘IS usage after the post-adoptive may not intensify, but may also diminish over time (p.527)’. In this circumstance, organizations have to make continuous improvements in the IT user’s quality, in order to realize a constant stream of net benefits from the investment of ES.

**Implication 4: IS Support Quality is a facilitating condition for ES benefits realization**

IS functions include a significant service component (Pitt, Watson et al. 1995). The IS functions provide assistance to users in IT artifact selection, installation and maintenance, trouble-shooting and training. In the era of the contemporary ES, the service role of the IS function is increasingly expanded. ES requires a
customized and intensified service to users, because ES is characterized by very complex and evolving functionalities and configurability. Therefore, the IS functions’ support and services acts as an imperative ‘facilitating condition’ that facilitates constant effectiveness of the ES. It is reasonable to argue that when effective IS functions are present, the ES adopter and the end-users are more likely to benefit from positive impacts of the ES.

‘Facilitating conditions’ is defined as ‘the degree to which an individual believes that an organizational and technical infrastructure exists to support his or her use of the system (p.453)’ (Venkatesh et al. 2003). In the Technology Adoption research stream, scholars conceive ‘facilitating conditions’ as an antecedent or determinant to a user’s behaviour intentions and actual IS usage behaviours. They consider that when people have better facilitating conditions, they are more likely to respond with positive cognition of IS use and adaptive system use behaviours. Scholars in the IS success stream also confirm the impact of ‘facilitating conditions’ on system usage and overall system success. Sabherwal, Jeyaraj et al. (2006) treats facilitating conditions as the contextual determinant of IS success, and identify the direct impacts of facilitating conditions on user experience, user attitude and user training.

In line with preceding studies in IT adoption and success, this study confirms the importance of ‘IS Support Quality’ as a facilitating condition to the effective use of Enterprise Systems. The respondents in the identification survey have commented on a few aspects of IS support: the service quality of both the internal and external IS functions, the quality and amount of training, and system-related knowledge retention and accumulation.

We note that, in spite of the commonly discussed contents of IS supports, a notable effect of the IS functions is to enhance end-users’ belief, understanding, acceptance of ES and a sense of adherence to ES usage discipline. The literature argues that ES deployment is evolved through a user-education process over time. This process should include the articulation and dissemination of both declarative knowledge and affective-related issues. The context study found that the issue of user education/training is more urgent in a
Chinese context, where ES adoption is at an initial stage in most cases, and people are struggling to adapt to their ES.

In conclusion, ES involves technology, people and business processes. Researchers and practitioners who are concerned with the management of sophisticated technology cannot overlook the people who will work with the system and the complementary practice/capability that enables the technology to work properly.

7.4 Sense making the Mandarin version model and two emergent categories

Besides the traditional evaluating constructs existing in IS success theories that have emerged from the study, the researcher also identifies new constructs: ‘User Quality’ and ‘IS Support Quality’ from the study. The researcher is keen to interpret these emergent constructs in the context of IS evaluation, and two questions are related to this analysis:

- In which circumstance will the user quality and IS support quality be relevant to an evaluation of a ‘IS’?
- How can we harmonize the user quality, IS support quality and those traditional IS evaluation criteria?

This section discusses two proposed models which assist the researchers in understanding the emergent categories – User Quality and IS Support Quality – and the IS-Impact measurement model. These two models present two theoretically sound interpretations for the possible relationships among these 6 emergent constructs identified in this study. It is beyond the scope of the study to test validity of each model; however, we believe that the identification of hypothesized models would bring forward implications for further research efforts in the IS success/effectiveness study.

7.4.1 Deriving a hypothesized model

Conceptualization of research models usually involves three key activities: 1) problem analysis, 2) related factor identification and 3) model design (Sedera
In line with a deductive research approach, the proposing of a hypothesized model occurs at an initial research phase, and a comprehensive literature review is the main approach to identify problem areas, relevant theories and/or models, and candidate model dimensions and measures. Based on the identified problem area and related theories, researchers will formulate these identified factors, constructs, and variables into an a-priori model or a set of hypotheses, which would be further tested with empirical evidence in later field work. With inductive studies, as opposed to the deductive solutions of model conceptualization, the problem area and factors with relation to the derived model is identified and evolved from the empirical investigation at the first place. A model or a piece of grounded theory would be later proposed as the final discussion that addresses the researcher’s summative interpretation and conclusion with relation to the study of interest. Related literature and existing theories are consulted for deriving the emergent model. This latter inductive approach is the one used in this study. Hence, the study proposes two hypothesized model to conclude the interpretation.

7.4.2 A causal model that incorporates the IS-Impact model

Drawing on the prior literature and the discussion made in the previous sections, we propose a causal model that represents a set of hypothesized causal relations between the IS-Impact measurement model and these two emergent categories: SQ and ISSQ. Figure 7.3 presents the causality among the identified constructs, which include three broad concepts and causality among these concepts.
The first component is the IS-Impact measurement model, consisting of four dimensions – Organizational Impacts, Individual Impacts, System Quality and Information Quality – which have been proposed by Gable et al. (2008), then have been verified in this study. The second component, the category of User Quality, emerging from this study, is made up of three sub-categories: knowledge-based quality, skill-based quality, and attitude-based quality. The third component is the other emergent category in the study – IS Support Quality, and 9 sub-categories were identified from this identification survey.

Three propositions are also posited in the causal model. Proposition 1 represents the interrelationship between the IS-Impact measurement model and the category of User Quality. We propose that User Quality is an antecedent of the IS-Impact. The quality of users will facilitate the quality of the ES, and will also influence the current and future impacts that the ES delivers to the users themselves and their organization. A detailed discussion is presented in an earlier section (section 8.3), where the researcher argues that the competent user is a critical driver to acquiring ES effectiveness in the post-ES implementation stage. Proposition 2 and 3 focus on the effects of IS Support Quality on User Quality and IS-Impact, respectively. Proposition 2 indicates that Support influences the quality of the ES artifact, which represents an important antecedent of the IS-Impact. Further, Support also influences the
quality of the user. Proposition 3 suggests that to the extent that the user receives the support they require for their effective use of the system, the user can more positively facilitate the system. As with these proposition, a discussion is presented in section 7.3, where the researcher argues that the IS Support Quality is a facilitating condition for ES benefits realization.

A review of literature shows supporting arguments with relation to the proposed causality among these constructs. In the user-focused studies, individual performance in the context of IS is always employed as the consequence of ‘competence’ of end-users (Marcolin, Compeau et al. 2000; Bassellier and Benbasat 2001; Yoon 2008; Yoon 2009). Scholars in the research stream of task-technology fit argue that some factors of individual users are considered to be influential to the task-technology fit (Goodhue 1995; Goodhue and Thompson 1995; Goodhue 1997; Goodhue, Klein et al. 2000; Dishaw, Strong et al. 2002). This argument is supportive of proposition 1 where the user quality is supposed to facilitate the quality of system. According to the I-survey, this study suggested that function-task fit is one of the very important characteristics of ES system quality in a Chinese context.

As with User Quality, the proposed effects of IS Support Quality is also supported by previous literature. Many SERVQUAL and IS Function studies have demonstrated the crucial influence of IS service quality on the IS artefact, end users and ultimate organizations’ performance. Scholars in the technology adoption stream argue that good IS support is one of the imperative organizations’ facilitating conditions for IS adoption and IS post-adoption.

The most similar theoretical model, describing the interrelationships among IS evaluation constructs, user-related constructs, and IS context constructs, is proposed by (Sabherwal, Jeyaraj et al. 2006). This model has been discussed in chapter 7. Although we employed a set of different variables compared to Sabherwal’s model, these two set of variables presented in both studies actually point to similar conceptual domains. Thus, we can also infer that the empirically validated causalities in Sabherwal’s model are indications of the goodness of similar relationships proposed in this causal model.
7.4.3 An alternative interpretation for the six categories

Chapter 2 discusses the diversity of the objects of study employed in IS evaluation studies. We found that the mainstream study effort in assessing IS in the post-implementation stage concentrates on the ‘IS artefact’. Researchers are keen to evaluate the goodness, value, benefits, performance, success and impacts of IS applications. Seddon, Staples et al. (1999) propose an IS effectiveness matrix to synthesize the multiple conceptualizations of IS and argue that different aspects of IS entail different measurements with relation to IS evaluations.

However, Alter (1999) criticizes the synthesis of conceptualization of IS proposed by (Seddon, Staples et al. 1999) and argue, ‘they ignore a central problem in understanding information system effectiveness, namely, that information systems are increasingly becoming integral parts of other work systems (p.41)’. Alter further advances two main propositions of IS effectiveness evaluations. One is ‘the Siamese twin’ problem: IT is so interwoven into the fabric of what organizations do, so that it is hard, and possibly meaningless, to try to measure the effectiveness of the IT component alone. Alter also stated ‘Conceptualizing information system effectiveness without looking at the work system that is being supported is increasingly like evaluating one twin but consciously ignoring the other.(p41)’ (Alter 1999). Alter raised the second propositions, advising researchers to focus on measuring the effectiveness of what Alter calls ‘work systems’, than just information systems.

Alter’s propositions and arguments involve re-considering the boundaries for defining and analysing the IS effectiveness. Alter believes ‘moving toward a work system view shifts the focus for understanding success (p.378)’ (Alter 2003). He further defines IS as ‘a special case of work system’ and asserted that this conceptualization of IS has many desirable characteristics, such as aiding in explanatory power and better ‘interpreting IS-related theories and ideas (p.457)’ (Alter 2008).

Reviewing the two questions we mentioned at the beginning of this section, we found Alter’s propositions and arguments offer an alternative interpretation to
our research findings, and are especially useful to harmonize the emergent constructs with current theory. This discussion attempts to conceptualize IS (ES) as a work system, to map the IS-Impact constructs to Alter’s work system, and to interpret the IS-Impact phenomenon from the perspective of the work system. The main model is shown in Figure 7.4, which illustrates the association between current IS-Impact constructs and work system theory. The remainder of the section will discuss several issues around the model: 1) Alter’s work system; 2) IS as a work system; 3) evaluation IS when IS is viewed as a work system; 4) conclusion and comments on the model.

![Figure 7.4 Mapping results between IS-Impact dimensions and the work system](image)

7.4.3.1 Alter’s work system

Alter defines work system as ‘a system in which human participants and/or machines perform work (process and activities) using information, technology, and other resource to produce specific products and/or service for specific internal or external customers’ (Alter 1999; Alter 2003; Alter 2006; Alter 2006; Alter 2007; Alter 2008). The work system method and framework includes both a static view of a current (or proposed) system in operation and a dynamic view of how a system evolves over time through planned change and unplanned adaptations (Alter 2003). Since the IS-Impact is a measurement model that takes a snap shot of current state of the stream of IS-Impact, only
the static view of a work system is related to this discussion. Alter’s work system consists of 6 core elements: the work practice, participants, information, technology, products/service and customer. A summary of the 6 elements is presented in Table 7.4.

<table>
<thead>
<tr>
<th>Work system element</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work practice</td>
<td>Cover a full range of situations that might involve highly structured workflows and/or ‘artful processes.</td>
</tr>
<tr>
<td>Participant</td>
<td>People who perform the non-automated work in the work system.</td>
</tr>
<tr>
<td>Information</td>
<td>Includes codified and non-codified information used and created as participant perform their work.</td>
</tr>
<tr>
<td>Technology</td>
<td>Hardware, software, and other tools and equipment used by the participants while doing their work.</td>
</tr>
<tr>
<td>Products and service</td>
<td>The combination of physical things, information, and services that the work system produces for its various customers.</td>
</tr>
<tr>
<td>Customer</td>
<td>People who receive direct benefits from products and services the work system produces.</td>
</tr>
</tbody>
</table>

Table 7.4 The work system elements (adapted from (Alter 2002; Alter 2008)

**7.4.3.2 IS as a work system**

Alter proposes a definition of an IS based on the general concept of a work system. He defines IS as ‘a system in which human participants and/or machines perform work (process and activities) using information, technology, and other resources to produce informational products and/or services for internal or external customers (p. 451)’ (Alter 2008). He further argues that ‘information systems constitute a special case of work systems in which the business process preformed and products and services produced are devoted to information (p.2374)’ (Alter 2002), and the IS as a work system (ISaaWS) ‘whose processes and activities are devoted to processing information, that is
capturing, transmitting, storing, retrieving, manipulating and displaying information (p.451)” (Alter 2008).

‘IT-reliant work system’, also proposed by Alter, is another conceptualizations related to both IS (IT) and work system: ‘a type of work system whose efficient and/or effective operation depends on the use of IT (p. 367)” (Alter 2003). However, it is noted that this conceptualization is not ‘Information Systems’, rather, it posits to a broader system which is supported by an IS.

There is a core point that the researcher needs to clarify when we attempt to incorporate Alter’s work system framework in the IS effectiveness evaluation. In this discussion, the researcher focuses on the first conceptualization of ‘IS as a work system’, rather the ‘IS (IT)-reliant work system’. The IT-reliant WS is work process centric, but this study is IS centric. We intend to evaluate the goodness of IS, rather than the goodness of the IS supported work process. Increasing reliance on computerized ISs has led to increasing degrees of overlap between work systems and ISs that support them (Alter 2008). Even though there is a trend that the IS become increasingly hard to separate from the work system that they support, we need to concentrate on the core of the IS discipline- the IS artefact. Alter claims that the ‘work system’ perspective involves re-considering the boundary of defining and analysis of IS effectiveness. We argue that the purpose of defining IS as a work system is to enrich our understanding of IS rather than confuse our research focus. Our research object is still the information system, but the content domain of IS has been carefully expanded by drawing on the theory of work system.

**7.4.3.3 Mapping IS-Impact to Alter’s work system**

This interpretation proceeds from a central interest in the importance of evaluating information systems (IS) in organisations, and adopts the IS-Impact model of (Gable et al. 2008) and work system framework of (Alter 1999; Alter 2003; Alter 2006; Alter 2006; Alter 2007; Alter 2008) as the primary commencing theory-bases.
The previous section discusses the conceptualisation of the ‘IS as a work system’ (ISaaWS). This section will ultimately triangulate the constructs of the IS-Impact model that has been identified in this study with the elements of ‘ISaaWS’. Important questions are: ‘Does conceptualising the IS as a work system yield a more complete and accurate estimate of its impact?’ and ‘Is the work system framework accounted for wholly or partially by existing IS-Impact dimensions and measures?’

Of note, Alter suggests that environment and infrastructure are key determinants of whether a work system can operate as intended and can accomplish its goals. Alter defines infrastructure as ‘human, information, and technical resources exist and are managed outside of it and are shared with other work systems. This includes support and training staff; shared database, and networks and programming technology (p.2374)’ (Alter, 2002). Given the description of infrastructure, this element covers the emergent construct of ‘IS Support Quality (ISSQ)’ identified in this study. Therefore, in this conceptual discussion, the researcher conceives the ISSQ as a determinant of the ISaaWS, rather a component or element of the ISaaWS. Therefore, the mapping exercise that relates the IS-Impact constructs to work system framework is excluded from the ISSQ, since the researcher consider this construct is beyond the scope of definition of ISaaWS.

Figure 8.4 presents the mapping results of IS-Impact constructs and the ISaaWS.

- Technology

The construct of System Quality (SQ) largely maps to Technology in ISaaWS. The technology is the technical component of a work system, such as software, hardware and other tools and equipment used by participants perform their work. The technology in a work system typically includes information technology, which performs a variety of operations with relation to information. Because the analysis distinguish between technology within the ISaaWS and the technical infrastructure that serve the ISaaWS, the most relevant technical component is the technical design of the IS software in the context of ISaaWS.
Therefore, most of the measures of SQ relate to technology in an ISaWS. The SQ can indicate the goodness of the technology in an ISaWS.

- **Information**

Alter suggests that information in a work system includes both codified and non-codified information. Some of the information may be computerized but other important information may never be captured on a computer (Alter 1999). However, in the context of the ISaWS, the research would be only concerned with the codified information, as the function of the IS is to codify information and to process information that already is stored in the computer systems.

The information quality (IQ) can largely map into the information component in an ISaWS. Several measures of the IQ seek to assess the goodness of information codified in the ES/IS applications, for example, the measure of information timeliness, accuracy and trustworthiness. Therefore, the dimension of IS in the IS-Impact model is also an indication of the quality of information in an ISaWS.

- **Products**

A work system’s purpose is to produce a product for the customer (Alter 1999). In the context of the ISaWS, this specific work system is to produce informational products or services for customers (Alter 2008). Reviewing the IS-Impact constructs identified in this study, several measures of IQ can address the products component of the ISaWS. It is noted that, besides the measures related to general information quality, several measures are directly related to the ES produced reports: report format, report usefulness and report utility. As ES reports are key products produced by ES applications, it is rational to infer that these IQ measures can account for the products in an ISaWS.

- **Work practice**

Figure 7.4 suggests that both the SQ and the Organizational Impacts (OI) in the IS-Impact model can address the Work Practice in an ISaWS. These associations between these constructs are different from the previously
discussed three pairs of constructs. The abovementioned mapping results suggest that the IS-Impact measures are arguably valid to measure the corresponding entity that exists in the work system theory. For instance, the measure of system quality is suitable to measure the technology component in an ISaaWS.

However, regarding the work practice, the associations between SQ, OI and Work Practice do not imply that IS-Impact constructs are suitable to measure the goodness of a work practice in a work system. The work practice is not the study object in an IS evaluation study. Our central interest is neither the organizational work practices that the IS has automated or enabled, nor the organizational work system that the IS supports. The conceptualization of ISaaWS is to offer the researcher a fresh theoretical perspective to understand the IS effectiveness and impacts, but must not confuse the focus of the study.

Reviewing the IS-Impact model and the work system theory in parallel, we find out interesting associations between the two theories with relation to the work practice. On the one hand, some of the measures in SQ map to Work Practice, such as system features, system configuration, and system extendibility. The items tend to address the extent to which the IS ‘fits’ with the Work Practice, rather than evaluating the goodness of the work practice and processes. On the other hand, most of the measures in OI also map to Work Practice. These items tend to address the extent to which the IS is influential to the work practice. Given the characteristic of ES, technology was employed to re-specify work process/practice. ES is always regarded as a driver enabling work system optimization and yielding positive outcome/output of the work system. The work system optimization might include better coordination, decision making, and business transparency; and the positive outcome/output might present as improved productivity, service, and cost reduction. The study argues that many items in Organizational Impact, including both existing and new identified items in this study, relate to Work Practice.
• **People**

Alter argues that People is an important component of a work system. (Jasperson, Carter et al. 2005)’s definition of work system says ‘an organization’s members are obviously core elements of the work system, both in performing work-related roles and as user of work-enabling technology (p.535)’. Explicit inclusion of people in the work system is an important distinction, especially after past confusions about the definition of IT artifacts (Alter 2006).

Alter differentiates ‘participants’ from ‘customers’ in the work system theory. Customers are the people who receive, use or benefit directly from products and services that a work system produces. Participants are people who perform the work within the work system. Alter noted that customers may also be participants, especially ‘in the work systems in which they play a significant co-production role (p.466)’(Alter 2008). People involved in an ISaaSWS usually take a dual role of participants and customers. On the one hand, they need to perform non-automated tasks with the technology in the ISaaSWS. On the other hand, they might be the consumers who receive the informational products in a downstream process in the overall business process supported by the IS. The researchers in the IS-Impact research stream refer to the term ‘key-users’ to denote people involved with the IS. According to the theory of work systems, the researcher attempts to reconceptualize users as ‘user-as-customer’ and ‘user-as-participant’, which relates to each human component in the work system respectively.

**User-as-customer (UAC):** Figure 8.4 shows that the Individual Impacts (II) can address the user-as-customer. UAC refers to the user’s role of being a IS customer who use the information imbedded the ISaaSWS to perform his business function-related task. UAC depicts the extent to which the IS facilitate the user’s work. Individual Impacts of the IS-Impact model demonstrate a large similarity to UAC in the organizational context, since the II seek to address the impact of ES/IS on individual people from the organizational perspective. Measures of II set forth to gauge the extent to which the ES/IS enhances the
individual’s work process and the extent to which the ES/IS improves the individual’s work results. Thus, most of the items in II can map to the UAC to measure how well the IS has facilitated the user’s work.

**User-as-participant (UAP):** Figure 8.4 shows that the User Quality (UQ) addresses the user-as-participant. UAP refers to the second role of users which is less explicit than the role of being a IS user. The UAP depicts the extent to which the users are influential to the IS and facilitate the enhancements of the IS. Thus, the competence or quality of the individual is important to this type of interaction between peoples and technology. People with different degrees of skills, training, knowledge, attitude and interests will impact on their participation of the activity in the ISaaS. Further, the performance of being a participant will also influence and is influenced by their experience of being a customer. We suggest that User Quality, which emerges from this study, addresses substantial relationship to this type of conceptualization of the IS user. UQ is a measure that set forth to evaluate the performance of the user-as-participant from three aspects: whether the user has sufficient knowledge, skills and affections to perform the role as a participant.

The differences between these two users’ roles are subtle and they are difficult to define. Alter indicates that ‘a work system participant who use information supplied by an information system may be a participant in the information system or may simply use information produced by an information system (p. 21)’ (Alter 1999). A manager who receives information from an IS might only act the role of IS customer, but acts as a participant in the work system of management. A manager who re-invents functions of spreadsheet and applies financial analysis using the spreadsheet is a participant of the spreadsheet and a participant in the system of creating the business analysis.

A review of IS success studies suggest that no distinction of user-as-customer and user-as-participant has been made in the research stream. The notion of ‘key-user’ referred to IS-Impact scholars depicts the role of ‘customer’ who is beneficial from the IS and from the informational products produced by the IS.
Alter (2008) points out that current definition of ‘IS use’ in the IS Success model are problematic:

‘It is not clear whether the user of the system is using its hardware and software to enter information or, alternatively, using information it produces. If either qualifies as IS use, it is possible for data entry users to be satisfied and information users to be dissatisfied and vice versa (p. 458).’

7.5.3.4 Conclusions for this interpretation

Drawing on the previous discussion, the researcher finally concludes this discussion with propositions and implications.

Firstly, according to the mapping results between two models shown in Figure 8.4, we conclude that the original IS-Impact model could partially address IS effectiveness when the IS is conceptualized as a work system. However, no existing dimensions and measures in the original model cover the component of participant in the work system. The previous IS-Impact study did not normally recognize the fact that the user is also influential to the IS applications. The user of an IS are not passive users who only receive what the IS can offer; rather, they can work as a proactive co-creator who participates in many types of interactions with the IS: IS design, customization, quality enhancement, configuration and update. Thus, we suggest that this emergent IS-Impact model plus a new dimension of User Quality can completely account for the IS-Impact phenomenon from the perspective of work system theory.

Secondly, the study calls for more research efforts relating to users and further clarification of the multiple roles of users in the context of IS. There is a long-standing confusion and debate on IS use in the area of IS success research. However, we believe part of the confusion is attributable to the lack of understandings of users’ multiple roles in their involvement with the IS. Different roles will entail different understanding and behaviour with relation to information systems. Hence, evaluation results would be different due to the evaluating respondents may take different roles and perspectives when they gauge the system.
# Chapter 8 Study Conclusions

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8.1 Overview

This chapter concludes the thesis by summarizing the major findings of the study, and discussing the study’s implications and limitations. Section 8.2 summarizes the findings, while section 8.3 discusses the implications for research, practice and methodology. Section 8.4 comments on the limitations and outlines the possible directions for future study. Section 8.5 presents concluding remarks.

8.2 Research summary

This study is conducted within the IS-Impact Research Track at Queensland University of Technology (QUT). The goal of the IS-Impact Track is, “to develop the most widely employed model for benchmarking information systems in organizations for the joint benefit of both research and practice” (Gable et al, 2006). IS-Impact is defined as “a measure at a point in time, of the stream of net benefits from the IS, to date and anticipated, as perceived by all key-user-groups” (Gable Sedera and Chan, 2008). Track efforts have yielded the bicameral IS-Impact measurement model; the “impact” half includes Organizational-Impact and Individual-Impact dimensions; the “quality” half includes System-Quality and Information-Quality dimensions. The IS-Impact model, by design, is intended to be robust, simple and generalizable, to yield results that are comparable across time, stakeholders, different systems and system contexts. The model and measurement approach employ perceptual measures and an instrument that is relevant to key stakeholder groups, thereby enabling the combination or comparison of stakeholder perspectives. Such a validated and widely accepted IS-Impact measurement model has both academic and practical value. It facilitates systematic operationalization of a main dependent variable in research (IS-Impact), which can also serve as an important independent variable. For IS management practice it provides a means to benchmark and track the performance of information systems in use.
The objective of this study is to develop a Mandarin version IS-Impact model, encompassing a list of China-specific IS-Impact measures, aiding in a better understanding of the IS-Impact phenomenon in a Chinese organizational context. The IS-Impact model provides a much needed theoretical guidance for this investigation of ES and ES impacts in a Chinese context. The appropriateness and soundness of employing the IS-Impact model as a theoretical foundation are evident: the model originated from a sound theory of IS Success (DeLone and McLean 1992), developed through rigorous validation, and also derived in the context of Enterprise Systems.

Based on the IS-Impact model, this study investigates a number of research questions (RQs). Firstly, the research investigated what essential impacts have been derived from ES by Chinese users and organizations [RQ1]. Secondly, we investigate which salient quality features of ES are perceived by Chinese users [RQ2]. Thirdly, we seek to answer whether the quality and impacts measures are sufficient to assess ES-success in general [RQ3]. Lastly, the study attempts to address whether the IS-Impact measurement model is appropriate for Chinese organizations in terms of evaluating their ES [RQ4].

An open-ended, qualitative identification survey was employed in the study. A large body of short text data was gathered from 144 Chinese users, and 633 valid IS-Impact statements were generated from the data set. A generally inductive approach was applied in the qualitative data analysis. Rigorous qualitative data coding resulted in 50 IS-Impact items with 6 IS-Impact dimensions grounded from the context of Chinese organization. The six dimensions are: 1) System Quality; 2) Impact Quality; 3) Individual Impacts; 4) Organizational Impacts; 5) User Quality and 6) IS Support Quality. This section will summarize the research findings around these four pre-conceived research questions.

**Research question 1: what essential impacts have been derived from ES by Chinese users and organizations?**

The prior IS-Impact approach indicates that the success of IS should be evaluated from ‘to-date’ impacts that have been realized (Gable, Sedera et al.
2008). This identification survey discovered two dimensions that present ‘to-date’ impacts of ES on Chinese users and their organizations: ‘Individual impact’ and ‘Organizational Impact’.

**Individual Impacts** are concerned with how the ES has influenced the performance of individuals in the context of organizations. These measures seek to assess whether the ES has helped staff of the organization to perform their tasks efficiently and effectively. An identification survey revealed that the ES had significantly influenced individual users’ job processes and job outcomes. Regarding the job processes, ES renders individual users an easy, clarified and standardized way to perform tasks. These benefits are reflected in the measure of ‘ease to do work’ and ‘operation standardization’. Regarding the job outcomes, this survey addresses four types of improved outcomes, consisting of improved job productivity, job accuracy, job awareness and job intensity.

**Organizational Impacts** refers to impacts of the ES at the organizational level. This study is interested in using perceptual indicators to assess the influences of ES on the Chinese organizations. The identification survey found that the ES has yielded various operational benefits in Chinese organizations, such as improved operational outcomes and outputs of functionalities, cost reductions and improved overall productivities. The most interesting finding is the fact that the ES may greatly impact on the business model and the management practices of the Chinese organizations. A number of measures have been grounded to describe and to gauge such organizational impacts from the identifications survey, such as information transparency, business process optimization, enterprise management optimization, and better business control and business decisions making.

**Research questions 2: what are the salient quality features of ES perceived by Chinese users?**

The IS-Impact approach indicates that, besides gauging those realized ES-impacts, the success of IS should be also evaluated from the quality of the ES, since the quality of ES is the best proxy measure for probable future
impacts that is anticipated (Gable, Sedera et al. 2008). Accordingly, two dimensions related to the ES quality, with a number of emergent measures, emerged in the identification survey: System Quality and Information Quality.

**System Quality** is a multifaceted measure designed to gauge how the ES performs from a technical and design perspective. The identification survey identified 12 useful measuring items which are instantiated with characteristics of the contemporary ES: system integration, system configuration and system extendibility. These 12 items relate to a variety of system quality aspects, ranging from commonly cited quality measures, such as reliability, response speed, accuracy to more context-specific measures, for example, appropriate software translation.

**Information Quality** is concerned with the quality of ES outputs, including the quality of the information the system produces in reports and on-screen. The identification survey identified 6 information quality aspects that the Chinese ES users were aware of. Three measures particularly attach to ES produced reports: the format, usefulness and usability of reports. Another three measures relate to quality of general information and data produced by the ES applications, such as information accuracy, timeliness and trustworthiness.

The abovementioned dimensions and measures provide answers to this research question regarding the salient quality aspects of ES that have been conceived by Chinese users. These two dimensions synthesize the commonly-cited ES quality features which were identified in the identification survey. They are recommended to be employed as proxy measures for gauging future impacts in a holistic IS evaluation model.

**Research question 3: Are quality and impacts sufficient to assess the ES success or effectiveness in general**

Gable, Sedera et al. (2008) suggested that aggregation of both ‘quality’ and ‘impact’ measures aid in a holistic model for the evaluation of the success of such IS applications. This research question seeks justification of the argument in the context of Chinese organizations. The researcher questioned, besides the excellent quality of the ES application, any supportive or complementary
factors facilitating the constant flow of benefit related to Enterprise Systems. In other words, to gain a holistic view of the success of an ES in a Chinese organization, should the evaluator consider other factors besides the existing dimensions? The other two emergent dimensions – User quality and IS support quality, grounded from the study, render us an arguable answer to this research question.

**User Quality** refers to the system-related competences and capabilities that end-users should possess in their working contexts. The quality of the system users is an important complement of Enterprise Systems. It is the fact that, without competent users who can use and deploy the system properly, even if the system is superior in terms of technical design, it would not be able to produce any significant effects. Results of Identification survey indicate 3 measures pertaining to the dimension of User Quality: 1) system-related knowledge, 2) system-related skills, and 3) system understanding.

**IS Support Quality** is concerned with the goodness of specialized services and supports provided by IT functions and/or groups. The identification survey indentified that several aspects of IS support quality were emphasized by Chinese users, and 9 measures were identified, drawing on the results of the identification survey. Thus the emergent measures include 1) end-user training, 2) knowledge retention, 3) software maintenance, 4) infrastructure maintenance, 5) IT stuff responsiveness, 6) IT stuff competence, 7) communication with IT staff, 8) vendor/consultant responsiveness, 9) cost-effective service of vender/consultant.

We conceptually argue that a constant stream of net benefit does not solely rely on ES itself. Although it is necessary for organizations to obtain an ES of good quality and advanced technical design, the ‘to-date’ system quality would not ensure the ultimate success of the ES adoption, and would not guarantee the realization of business benefits in the future. We further argue that the presence of both the ES of good quality and the ES complements, including ‘User Quality’ and ‘IS Support Quality’, yield the constant stream of net benefits to ES adopters. The alignment between the ES product of acceptable quality and these
ES complements is the critical drive for yielding positive IS-Impacts to the organization right now and in the future.

Research Question 4: Is the IS-Impact measurement model appropriate for Chinese organizations in terms of evaluating their ES?

In order to answer this question, a comparison between the emergent Mandarin version model and the existing global IS-Impact model has been made. At the dimension level, the co-occurrence of four dimensions – System Quality, Information Quality, Individual Impacts and Organizational Impacts in both models, suggests that the IS-Impact model is useful for rendering the phenomenon of IS-Impact regardless of the context. The comparison in the level of measures between the two models indicates the differences in the IS-Impact between the Chinese and the Western contexts. The identification survey identified a number of context-specific measures in each dimension, which will strengthen the appropriateness of the IS-Impact model in the Chinese context. A triangulation of the empirical evidence of the identification survey and findings in the context research further justify the validity of these newly-identified and context-specific measures.

The final research finding of the study is the Mandarin version IS-Impact measurement model that includes 4 dimensions and 38 measures. We also propose two hypothesized model to harmonize the IS-Impact model and the two emergent constructs – User Quality and IS Support Quality.

- Model 1- a causal model: Drawing on the prior literature and the discussion made in the previous sections, we propose a causal model that represents a set of hypothesized causal between the IS-Impact measurement model and these two emergent categories: SQ and ISSQ.

- Model 2 – IS as a Work System: Drawing on Alter’s Work System theory, this discussion attempts to conceptualize IS (ES) as a work system, to map the IS-Impact constructs to Alter’s work system, and to interpret the IS-Impact phenomenon from the perspective of a work system.
Lastly, the study proposes four arguments about ES effectiveness in China, based on the discussion and interpretations of the research findings:

- Enterprise systems software should be fully localized and adapted to the requirement of new markets.
- The essential impacts of Enterprise Systems on Chinese organizations are ES-enabled change of Chinese conventional management practice and business model.
- User quality is a critical driver to acquiring ES effectiveness in post-ES implementation stage.
- IS Support Quality is a facilitating condition for ES benefits realization

8.3 Research implication

This study is part of the efforts of the IT Professional Services (ITPS) research program to establish a widely accepted IS-Impact measurement model. Having the Gable et al. (2003) IS-Impact measurement model as theoretical foundation, the study attempts to explore IS-Impact phenomena in Chinese organizations. The overarching study aim is to develop a simple, robust, economical and appropriate model for gauging the impacts of contemporary Enterprise Systems in Chinese organizations. The study is significant as it is the first effort that empirically and comprehensively investigates IS-Impact in China. Specifically, the research implications can be classified into theoretical implications, methodological implications and practical implications. The research contributions refer to those contributions derived from the study that can be used by future researchers to derive new knowledge and enhance existing knowledge. The methodological implications provide experience with research methods that future researchers can reference. The practical contributions refer to those contributions derived from the study that can be directly applied by practitioners and organizations.
8.3.1 Theoretical contributions

The study explores the state of enterprise systems in China and provides up-to-date information and observation based on triangulated evidence from a variety of resources. The descriptive report yielded from this study can aid in a contextual understanding of Enterprise Systems in China for future research on ES in the Chinese context.

The most important contribution of the study is the identification of appropriate dimensions and measures of ES-Impacts for Chinese organizations. The majority of prior IS evaluation studies in China have not indicated the rationale for their selection of evaluation dimensions and measures. This arbitrariness can confound comparison of findings across evaluation studies. The systematic consideration of dimensions and measures of IS effectiveness will identify those most applicable and reliable, and will significantly enhance the credibility and reliability of IS evaluation.

This study emphasizes the importance of context in research that extends existing theory to a new research context. The Chinese context, not only helped to shape the study design, but, also, being tied closely to the research findings, served as an analytical tool to interpret the deployment and impacts of ES in Chinese organizations. Chapter 3 identifies three types of misalignments between packaged ES and the Chinese context. In line with observations made in chapter 3, we argue that, in order to take full advantage of ES applications, it is imperative for Chinese adopters to spend effort on the development of complementary competences and resources required by the ES application, the quality of the ES user and the quality of ES support/service being centrally important. It is interesting to see that both the context study and field work are consistent on this issue. Further, we observed a critical misfit in light of the management model differing between packaged ES and the Chinese context. We thereafter argue that one of the main impacts from packaged ES is to reshape Chinese organizational structure and to change management conventions.
The study theoretically re-specifies the IS-Impact concept as a formative construct, from a wealth of empirical qualitative data. This study exercise provides an example of how to identify relevant measuring items in qualitative research and how to organize a large amount of relevant measuring items into a multifaceted formative construct. The study conducted the formative construct specification according to the criteria of formative construct specification and decision rules proposed by (Jarvis, MacKenzie et al. 2003; Petter, Straub et al. 2007) and descriptions of analytic theory given by (Gregor 2006; Gable, Sedorra et al. 2008).

The identification of the contextualized Mandarin version IS-Impact model is the biggest challenge and the most important contribution of this study. Since there are no prior studies that adequately investigate IS evaluation in this specific context, the researcher employed the identification survey to inductively identify the contextualized dimensions and measures of IS-Impact for the new context.

The study attempts to provide the Chinese ES adopters with a set of measures manifesting the quality of completeness; in other words, to demonstrate the content validity of the formative construct under investigation. The study discovers a wealth of IS-Impact measurement items by directly soliciting Chinese users’ practical experience with ES, through the open-ended and brainstorming-styled identification survey. This research design strengthens the degree of content validity of the IS-Impact construct, while stressing requisite relevance to practice. The study also attempts to address the quality of mutual exclusivity of the Mandarin version measurement model of IS-Impact. Mutual exclusivity of the dimensions and measures allow undistorted observations of the level of IS-Impact and also facilitates clearer aggregated statistical analysis in the future. In conclusion, both the qualities of completeness and mutual exclusivity will strengthen the credibility of the Mandarin model: a reliable tool for gauging the value of the Enterprise Systems in Chinese organizations.

This study also provides evidence of the generalizability of the IS-Impact approach. The correspondence of the dimensional level between the two models
is a good indication of the external validity of the existing IS-Impact theory and model proposed by (Gable, Sedera et al. 2008). It suggests that the analytical power of the IS-Impact model can apply to the phenomenon of IS-Impact in different research contexts.

Another contribution of the study is that it is the first research effort to formally extend established IS evaluation theories and models into China and also to contextualize these theories produced in the West in relation to the situations in China. This contextualized and extended theory and/or models provide Chinese academics with a most suitable and relevant theoretical base for carrying on more research in IS evaluation for this particular context.

Drawing on the findings in the identification survey, the thesis recommends several modifications to the original model accounting for the specific features of IS success in Chinese context. These modifications manifests as a list of contextualized measures occurring in each IS-Impact dimension. The candidate speculates that these measures might also make sense for other countries that have a predominantly Confucian social philosophy. Because the new measures are instigated by many contextual factors, including but not limited to 'culture'.

Finally, this study conceptualizes IS (ES) as a work system, maps the IS-Impact constructs to Alter’s work system, and interprets the IS-Impact phenomenon from the perspective of a work system. Having examined the IS-Impact approach in light of work system theory, we suggest that, when IS are defined as a work system, rather than an IS application, the original IS-Impact model does not address a whole phenomena of IS success. The original IS-Impact model tends to neglect the role of users who act as participants in the ISaaS, who has potentials and capability to proactively influence and facilitate the IS, rather than only passively receive impacts from the IS. Therefore, we suggest that this emergent IS-Impact model plus a new dimension of User Quality can completely account for the IS-Impact phenomenon from the perspective of work system theory. The study finally proposes two conceptualizations of users with relation to different roles that they will take during the interactions with IS: user-as-customer and user-as-participant.
8.3.2 Methodological implications

This study explores the use of innovative research methods in a traditional study field: employing a qualitative and inductive study design to investigate a construct specification and conceptualization study. This section has summarized a number of implications in relation to research design and methodology. We realize that this is not a conventional IS effectiveness study. Most research innovations of the study are attributable to the innovative research design. The methodological implications are described below.

1. The research provides evidence that qualitative research methods are applicable to investigate research topics regarding the impact and success of an IT artifact. Since IS effectiveness or failure result from complicated interaction with the people who use it and with the environment within which the IT artifact is embedded, qualitative methods provide an effective and useful way of studying an object which is sensitive to context, or where the objects should not be isolated from the research context.

2. The research is a useful example of constructing a context-specific model and/or theory through explorative research design. Most studies on theory contextualization and extension rely on the approach of replication and confirmatory, as shown in previous studies in the research stream of IS success. This study suggests that, rather than testing a-priori models or confirming pre-conceived hypotheses, a more open-ended and explorative research design is also effective in extending theories to some new context or scenarios. This study extends the original IS-Impact model into the new context of China. Our open-minded and explorative design provides us with advantages in finding unique and context-specific issues regarding Enterprise Systems, and leads to a new model specialized for the particular context. We believe that a model replication and confirmatory design would not be more effective than this study in finding new measures and dimensions. Some important and subtle issues might not be brought to the surface if the study had employed a confirmatory-fashioned method.
3. The study implemented a generally inductive approach to investigate the object of interest. It is an evolving learning process to study the methodology. The researcher has experimented with both inductive and deductive study approaches, comparing the pros and cons, and exploring probable opportunities and constraints. We eventually find a balance between the prior theoretical influence and the intuitively grounded investigation – a generally inductive approach. This approach allows the researcher to work under a sound theoretical paradigm and also gain leeway to seeking research findings from fieldwork and first-hand empirical evidence. At the late stage of the study, the researcher ultimately triangulates extant theories and newly-acquired evidence to collaborate the research findings.

4. The study translated, modified and contextualized an available instrument in the Chinese context. The instrument contained two open-ended questions inquiring about the Chinese ES users’ opinions and experiences with their ES. Previous studies suggested that the Chinese are conservative in commenting about issues in public, and that the Chinese are reluctant to be critical as they want to maintain a harmonious environment. However, the study suggests that this open-ended instrument is applicable to gathering information from Chinese respondents. Chinese respondents were apparently quite frank and open-minded to the question posed in the questionnaire when they were ensured that their identity was suppressed. Currently, increasing numbers of researchers are interested in carrying our studies in China, but, constrained by resources and lack of regional proximity, they might or might not be able to do fieldwork at present. This study provides researchers with an example of how a carefully designed and contextualized instrument would be capable of eliciting valid responses from Chinese respondents.

5. This study utilized a wealth of short textual data gathered from a large sample of respondents. Therefore, we provide an example in dealing with this particular type of textual data. Open-ended questions are an efficient and economic research method that always been used in survey study.
However, according to the researcher’s best knowledge, though most studies involving questionnaires will attach a few open-ended questions to complement their structured scoring questions, very few studies actually make the most of their open-ended question. Few studies have reported their method of analysing this part of the data and the analysis results are seldom legitimized. One reason may be due to a lack of structured methods and existing examples that researchers can reference. This study provides a structured and reproducible guideline, approach and techniques for managing and analysing short textual data. The research practice can be directly applied by future researchers who also wish to use open-ended questions in their study.

6. This study compared and experimented diverse qualitative data analysis methods. We do not take any existing methodology text for granted, but cautiously choose the most-suitable techniques for analysis. For example, the researcher utilized analysis tactics from Content Analysis and Grounded Theory Methodology respectively. Given the research objectives, the research design, characteristics of available data and purposes of data analysis, we found that both research methods are not totally applicable to the analysis; rather, both of them are worth referencing to some extent. Thus, rather than being committed to a single method, the researcher flexibly combined a few analysis techniques that were most appropriate for the study. The study presents a case that methodological flexibility and methodological rigor are not contradictory. Although the researcher observed tension between these two factors, we still argue for the benefits and advantages of innovative usage and combination of various available methods in one study.

7. Finally, the thesis provides detailed descriptive accounts of data analysis which can be applied by future researchers.

8.3.3 Practical implications

Drucker (1993) states that, ‘If you cannot measure it — you cannot manage it … without systematic measurements, managers have very little to guide their
actions other than their own experience and judgment.’ In practice however, IT investments are rarely systematically evaluated post-implementation in China. Where post-implementation review occurs, the idiosyncratic IS evaluation measures and process worried Chinese managers. This study hence provides guidelines for practitioners lacking knowledge about what issues to watch out for when evaluating the success of their Enterprise Systems. The specific practical implications are outlined in this section.

The most important contribution for practice is the Mandarin version IS-Impact model. Although the research does not operationalize this model into an ES evaluation instrument, it is still useful in guiding managers to rationalize their benefits from the ES and to examine the quality of the system. They can use the model’s dimensions and measures as a checklist to ensure if the ES is in a generally good condition for realizing positive impact on their organization. The six dimensions and 50 measures provide Chinese practitioners a flexible and robust toolkit to supervise the running of the ES and the state of benefit realization from ES investments. Specifically, the four dimensions of ‘System Quality’, ‘Information Quality’, ‘Individual Impacts’ and ‘Organizational Impacts’, with a set of 38 measures, could be directly put into a questionnaire, benchmarking the current impacts of the ES and identifying bottlenecks for the future impacts. Moreover, each dimension corresponds to a particular IS management question. Depending on which type of management questions the manager is concerned with, the manager can use appropriate measures alone or in aggregate.

**System Quality** — where managers are concerned with the conditions of the software, they can evaluate the technical aspects of the system by using the measures pertaining to this dimension.

**Information Quality** — where managers are concerned with the quality of the information products produced by the ES, they could assess the goodness of the information inside the system and/or reports delivered by the ES.
Individual Impacts — where managers are concerned with the influence of the ES on individual users, they can utilize this dimension to gauge the benefits at the level of individual users.

Organizational Impact — where managers are concerned with the influence of the ES on the whole organization, they can utilize this dimension to gauge the benefits of ES at the level of the organization.

Aggregating the dimensions of System and information Quality will render a more complete review of the system. Another practical way to use these dimensions would be to measure the quality of the system during the early periods preceding system acquisition or prior to any system update. As for the measures of ‘impacts’, they offer a comprehensive scale or a checklist for assessing ‘to-date’ effectiveness or success of the acquired system. Moreover, Managers can use the ‘impacts’ items for later periods in the ES life cycle when different impacts of ES are realized. Although the dimensions can be used separately to deal with different IS management issues and evaluation questions, we strongly advocate practitioners using them jointly. This is because they are designed to be used additively, collaborating to render a holistic view for assessing the effectiveness of ES in Chinese organizations. In conclusion, for Chinese managers in the post ES-implementation stage, the dimensions and measures can assist them in understanding ES use, monitoring ES deployment and managing business process change and new user requirements, and planning for the best business benefits.

The other two dimensions — ‘User Quality’ and ‘IS support Quality’ also provide valuable implications for the manager. Management should realize the importance of qualified users for contemporary ES usage post-implementation. They should not be considered as passive consumers of technology, where, by contrast, they are active participants who play important roles in ES exploration and re-configuration at the later stage of an ES life cycle. Thus, management should value the knowledge and skills of competent ES users, since these competence and capabilities related to the system are the less tangible and invisible ‘IS assets’ of the organization. When evaluating ES effectiveness,
managers should not overlook the quality of the end users. The problem of lack of competence, such as insufficient system knowledge, skills, and appropriate understanding of the ES, may be the real bottleneck that hinders the positive impacts of the ES.

Similar to the quality of ES users, management should also recognize the importance of IS support functions. Theoretically, quality of IS support is the critical facilitating condition for the success of the ES. Practically, we interpret IS support quality as one of the imperative aspects of infrastructure, based on which the ES can run properly and yield business benefits. The construct of ‘IS support quality’ enables managers to supervise the effectiveness of IS support functions. These measures of the IS Support Quality point to the major areas to which management should pay attentions.

Finally, some features manifested in the Mandarin model also suggest its practical usefulness: it is an economical tool for evaluating the IS; it is easy to understand; it gauges the IS-Impact from multiple perspectives; and it uses tangible and less tangible measures.

### 8.4 Research limitations and future direction

No research is perfect and this study is no exception. There are a number of limitations to consider. This section highlights the major ones as follows:

1. Due to practical constraints (time, access, and finance) and the difficulties of implementation, the researcher was not able to present in the participant organizations, and was not able to supervise the data collection practice personally. All the questionnaire administration and collection was performed by the IT department staff in PETRO on behalf of the researcher. It was difficult to ascertain whether the person to whom we addressed the questionnaire was the one who actually filled out the questionnaire; surveys addressed to certain entities in the organization may in fact have been filled out by others.

2. Although having endeavoured to employ a generally inductive research design, the researcher has to admit influence coming from the theoretical
base – the IS-Impact measurement model. The theoretical model may have substantially influenced the data collection, data analysis and interpretation. For example, the open-ended questions presented in the instrument of the identification survey indirectly related to the existing constructs of the IS-Impact’s dimensions. This is possibly a factor in the substantial similarities that have been observed between the Mandarin version model and the original model, especially in the dimensional level.

3. Due to constrained resources, the data collection was conducted in one Chinese organization. The research findings may be contingent on the situation of the organization, such as the type of ES that the company adopted, the particular state of their ES deployment and usage, the ownership of the organization, and other contingent issues.

4. The qualitative data was gathered in open-ended questions disseminated in the form of a questionnaire. The researcher cannot gauge the way that respondents interpreted and reflected on the questions. Rather than effectively considering a broad range of issues, a respondent may be only able to comment on the issues that they were aware of at that time. In this case, the wealth and depth of the data might be compromised.

5. The study is qualitative in nature, thus we cannot rule out personal bias and subjectivity in the study. The source of subjectivity is twofold. One is from the data generation source – the human respondents from whom the study solicited the empirical data; and the other is the data analysis instrument – the human coder and researcher by whom the data was interpreted and analysed. Respondents might be influenced by the many contingent and contextual factors that the study would not be able to guess. The researcher is inevitably influenced by her personal professional and academic training and knowledge.

In the course of discussing the issues in this work, we have already noted areas that future study should address. Further studies are encouraged to extend the validity, generalizability and reliability of the Mandarin version IS-Impact model. There are three major recommendations for future study.
1. Mackenzie and House (1979) recommend a guideline for developing standardized instruments, where the authors proposed a staged research cycle: (1) an exploratory study phase to develop hypothesized measurement models, and (2) a confirmatory study phase to test the hypothesized measurement models against new data gathered. Thus, this work can be positioned as an exploratory phase study in a complete research cycle committed to the topic of the evaluation of Enterprise Systems in China. With the study findings as the hypothesized model, a future study could operationalize the Mandarin version model into a structured instrument, and validate the credibility of the grounded model against quantitative evidence. Furthermore, this hypothesized model can be further parallel validated with the existing IS-Impact model, aiding in the ultimate generalizability of the IS-Impact approach.

2. Replications of the various aspects of the study in other contexts are necessary as it is difficult to ascertain the validity of findings on the basis of a single study in one research scenario. Multiple case studies replicating the same research design would ultimately aid in internal and external validity. There are several recommendations for future studies related to ES evaluation in China: 1) move to other complex IT innovations in organizations rather than being focused on ES system; 2) examine ES effectiveness in several Chinese organizations with diverse status in enterprise ownership; 3) examine and compare the effectiveness of ES between international ES products and top-tier local ES products; 4) a longitudinal study in the same company.

3. Further conceptual studies and validation tests are required in relation to the emergent constructs of ‘User Quality’ and ‘IS support Quality’. Due to the explorative and inductive nature of the study, the identification of the two constructs is at the preliminary stage. It is worthwhile investigating the precise conceptualization of the constructs in a future study.
4. Further validation of the proposed causal model and testing of the hypothesized causalities among the constructs of IS-Impact, user quality and IS support quality, is recommended.

5. Further identification and conceptualization of user-as-participant and user-as-customer is desirable. A long-standing confusion and debate on IS use is found in the area of IS success research. However, we believe part of the confusion is attributable to the lack of understandings of users’ multiple roles in their involvement with the IS. Therefore, we call for more research effort in this area. It is a promising area that would bring value and insights to both theory and practice.

8.5 Chapter summary

The chapter outlined the implications of the study for practice and research. Both strengths and limitations are also evaluated in the chapter. Overall, study results provide insights into the phenomenon of IS-Impact in the context of China. We believe future researchers and practitioner who are interested in the effectiveness of Enterprise Systems in China will find this study and findings useful. It is strongly recommend that IS researchers extend the findings of the Mandarin version IS-Impact model, amplifying our understanding of IS-Impact and ES usage in China.
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Appendix A. Dimensions and Measurements of Chinese IS success / IS performance evaluation models

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## 2. Dimension of Technical Competence

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| P. Shao (2000)      | Comprehensive evaluating MIS using AHP                    | Empirical: Development IS instrument    | IS Implementation Success    | (1) Scientifically setting objectives of IS project  
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- Zhang (2004) evaluation index system based on literature review:
  - Conceptual Orientation
  - Service Quality

- W. Xu & Q. Zhang (2001) IS evaluation system with an integrated method of Delphi, AHP, Fuzzy method and Grey Incidence degree:
  - Empirical: Development IS instrument
  - System Environment
  - (1) The degree of management support
  - (2) Share ability
  - (3) Guiding ability

- F. Gao (2007) Performance Assessment index of IS, referring to COBIT framework and grading evaluation:
  - Non-Empirical: Conceptual Orientation
  - Capability of Management and Control
  - (1) Organization control
  - (2) Communication control
  - (3) Operation control
  - (4) Security control

- F. Gao (2007) Performance Assessment index of IS, referring to COBIT framework and grading evaluation:
  - Non-Empirical: Conceptual Orientation
  - Employee’s Adaptation
  - (1) Utilization rate of system
  - (2) Organization learning capability
Appendix B The English version of Package

The Impact of Enterprise Systems
@ [Sample Organizations]

Prepared by:

IT Professional Services Research Program (ITPS)
Queensland University of Technology (QUT)
Brisbane, Australia

In cooperation with

Renmin University of China
Beijing, China

Research Proposal

2008. 6
The Impact of Enterprise Systems @ [Sample Organizations]

a proposed study by the
IT Professional Services Research Program (ITPS)
Queensland University of Technology (QUT)
in cooperation with the
[Collaboration institutions]

A proposal to survey the Impact of the [Enterprise Systems application] at [Sample Organizations].

Executive Summary

Introduction: Over the past few years your organization has invested significant resources in [ES APPLICATION]. The impact of the [ES APPLICATION] is now being experienced across all levels of most departments in your organization. Gauging the enterprise systems (ES) impacts is often difficult, because ES entails all levels of users crossing many functional areas in an organization. However, without systematic measurements, managers have very little to guide their actions other than their own experience and judgment.

In response, this proposed project is designed to help organizations to measure the success of your enterprise system applications and their impacts on both the organization and the individuals, and further justifying ES applications’ value and contribution to the productivity, quality, and competitiveness of organizations. This research project is proposed by IT Professional Services (ITPS) Research Program at Queensland University of Technology (QUT) – Brisbane, Australia, in collaboration with [INSTITUTION].

Project Aim: The purposes of this project are two folds: one is to identify the impacts of [ES APPLICATION] (IS-Impact) in your organization, providing you a 360-degree view of the success of an installed enterprise system and to better target future investments. The second is to develop a pragmatically enterprise systems assessment tool, which can be used to make comparisons among organizations, departments, vendors and stakeholder groups.

Your benefits:

- This project is expeditious
- It is low-cost and requires minimal resources from your organizations
- It will help you in improving ES in organization hence provides low/free consulting opportunity to the organization.
- It is low-risk, ethics/confidentiality commitments guaranteed.

Research activities: The proposed project will commence with a brief contextual study of enterprise systems in [ORGANIZATIONS]. Subsequently two survey rounds will be conducted in order to measure the IS-Impact in organizations and two survey instruments will be designed to fulfil objectives at each project phase. The first survey “identification survey” attempts to identify maximum applicable IS-Impact dimensions and measures for sample organizations. The second survey “confirmation survey” is then developed to verify the credibility of dimensions and measures
identified in last survey, ultimately yielding a complete but economical measuring model and instrument to effectively gauge IS-Impact.

**Deliverable:**
- We will provide you with a copy of the final report describing the state of [ES APPLICATIONS], the key-user-group characteristics and other descriptive findings from the survey (please refer to appendix B for the template report)
- We will provide you a presentation on data analysis/analysed data/findings
- We will provide you a set of customized IS-Impact measurement instruments for your organizations which can be repeatedly used in accessing IS-Impact in [ORGANIZATIONS].

**Research Team and Our Credibility:** This research project is proposed by IT Professional Services (ITPS) Research Program at Queensland University of Technology (QUT) – Brisbane, Australia. ITPS focuses on technology-lifecycle-wide 'business models for effective IT services delivery', and Information Systems Success is a primary research area we concentrate. ITPS commence the research on IS Success since late 1990s, with presenting IS-Impact measuring model, the most robust, validated and economic IS Success model and publishing research works continuously on top tier academic journals and conferences (please refer to Appendix C), we have established ITPS research centre a leading authority on the IS Success/IS evaluation area. ITPS research centre is lead by Professor Guy Gable, who has been involved with large packaged application software for over 20 years, the first few as Senior Consultant with Ernst & Young in Canada, then Price Waterhouse Urwick, in Sydney and Canberra. Besides, most of the research members in the projects have acquired PhD or been pursuing PhD and experienced in ES consultant and ES research.

1. **INTRODUCTION**

Information systems and in particular Enterprise Systems are considered to be huge investments that organizations at a given stage have to make. However, the impacts resulting from ES are particularly difficult to gauge. These organizations which deployed information systems are keen to measure the success of the IS and their impact on both the organization and the individuals to justify their value and contribution to the productivity, quality, and competitiveness of organizations. Without systematic measurements, managers have very little to guide their actions other than their own experience and judgment. Information Systems Researchers have introduced a variety of frameworks and measurement models that can help in evaluating Information systems success using both tangible and intangible measures. Many researchers adopt already existed tools such as balanced scorecard, TQM or ServQUAL to evaluate Information Systems. The IT Professional Services (ITPS) Research Program at Queensland University of Technology (QUT) – Brisbane, Australia begun the Information System Impact (IS-Impact) research since 2000, aiming to develop the most widely employed model for benchmarking information systems in organizations for the joint benefit of both research and practice (the ‘IS-Impact’ model). One of the most remarkable contributions of this research group is the IS-Impact Measurement Model. This IS Impact model helps managers and practitioner to measure ES impact on their organizations. The study model and instrument offer a practical means for organizations to evaluate the success of complex, contemporary information systems. The model was tested and validated in the Australian context.
This project is part of a study that aims to extend and validate the IS-Impact measurement model to the ______________________________context. This extension of the model is a step toward the model generalization. The overarching goal is to enhance the status of the model and prove its applicability in different context settings. In other words, the extension project will make the model more complete, universal, valid and reliable. This project aims to expedite this objective through effective collaboration with industry partners like _________________.

This will help corporate to evaluate their Enterprise System investments in more scientific and reliable manner.

2. WHY YOU SHOULD PARTICIPATE IN THIS STUDY?

- This study will help participant organizations to gauge ES impacts from multiple stakeholder perspectives (e.g. strategic, management, operational, technical) and understand the critical facets relevant to each respondent cohort.
- The study will help organization to measure return on investment on ES. This will help decision makers to make future investment in ES.
- To evaluate ES impacts using an ‘easy-to-understand’ survey instrument and which can be applied repeatable to identify and understand trends in ES performance over time.
- To establish an ES impacts benchmark for comparison across time, organizations, departments, ES-types, ES-modules or across other demographic groupings.
- This study facilitates collection of 'other' evidence on selected ES issue along with the survey in the participant organization.
- The study will help in improving ES in organization hence provides low/free consulting opportunity to the organization.
- Apart from this, your organization participation in the study will enhance your linkage with international academia.
- Your participation will contribute to academic research in the area of IS Impact measurement.
- You will receive complete analysed report on ES status of your organizations from ITPS, QUT, Brisbane, Australia.
- Softcopy of Ph.D thesis of researcher for your library.
- Data set in Excel/ SPSS format for further analysis at your end.

3. ABOUT UNIVERSITY & RESEARCH GROUP

Queensland University of Technology

Queensland University of Technology (QUT) is a leading Australian university. It is well known as 'a university for the real world' because of its close links with industry and its relevant teaching and applied research. It is one of Australia's largest universities, enrolling 40,000 students, 12 per cent from overseas. The university offering a broader range of undergraduate degrees than most other universities, with the flexibility to choose a combination of study areas as well as participate in exchange programs with overseas universities (from http://www.qut.edu.au/about/university/). According to The Times Higher Education, QUT was rank 195 in the world university ranking in the year 2007.
The IT Professional Services

The IT Professional Services (ITPS) Research Program exists within the Business Services Research Theme in Faculty of Information Technology (FIT). IT Professional Services (ITPS) - focuses on technology-lifecycle-wide 'business models for effective IT services delivery' through: (i) Metrics for improved management of ITPS (how to evaluate ITPS-related issues, impacts and choices) from both the services provider and receiver perspectives; (ii) Tools and techniques for the delivery of high-quality IT professional services; and (iii) Cooperative Knowledge Management processes.

Research Team:

Prof. Guy G Gable: Professor Gable has been involved with large packaged application software for over 20 years, the first few as Senior Consultant with Ernst & Young in Canada, then Price Waterhouse Urick, in Sydney and Canberra. In 1995 he initiated a major research stream at QUT on Enterprise Systems, and has since published extensively on ES implementation issues.

Prof. Mao Ji-Ye: Professor Mao is Associate Dean for research and international programs, School of Business, Renmin University of China. Professor Ji-ye Mao’s Ph.D. (Management Information Systems) was from the University of British Columbia, Canada. His major areas of research include the design and evaluation of information systems, their usefulness and usability along with their behavioural and cognitive bases, and user-centred design methodologies. My prior research has appeared in most of the major international journals on human-computer interaction, and MIS journals.

Dr. Darshana Sedera: Dr. Darshana Sedera received his PhD in February 2006 for his thesis titled "Enterprise Systems success: a measurement model". His PhD thesis resulted in the derivation of the ES-success measurement model, which provides the theoretical and logical underpinning for the proposed dependent variable of the proposed study. interrelated dimensions. The success of this related work is evident in the 29+ research publications that Darshana authored / co-authored during his PhD candidature.

Researcher Assistant
Lan Cao
Nur Fazidah Elias
Naif Alotaibi

4. OUR RESEARCH THOERY AND MODEL

4.1 The Research Model

The IS-Impact measurement model was firstly introduced in 2003 by ITPS research centre in QUT⁷. This model captures the complex nature of IS-Impact

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⁷ The model was first empirically tested using survey data gathered from 456 respondents representing twenty-seven Queensland public sector organizations that implemented SAP R/3 in the late 1990s. Given past IS success studies have lacked a theory-base, the selection of model constructs in this study was grounded in an initial, first-round exploratory (model building) survey aimed at confirming the relevance and completeness of the most widely cited IS success model. Analysis of the second-round, confirmatory, ‘weights’ survey data (model testing) demonstrated the discriminant validity of the four dimensions, as well as their convergence on the single higher-order phenomenon – Enterprise Systems Success (ESS). Criterion validity testing further demonstrated the additivity of the four dimensions of success, and the
by four dimensions: (1) Individual-Impacts, (2) Organizational-Impacts, (3) Information-Quality, and (4) System-Quality, as reflected in figure 1.

**Figure 1: The IS-Impact Measurement Model (Gable, Sedera et al. 2003)**

**Individual-Impacts** are concerned with how the ES has influenced the performance of individuals. These measures seek to assess whether the ES has helped staff of the organization to perform their tasks efficiently and effectively, e.g. interpret information accurately, better understand information and work related activities in their area, make more effective decisions, and generally be more productive.

**Organizational-Impacts** refer to impacts of the ES at a broader level. Here we are interested in the most intuitive organizational performance indicators e.g. improved outputs or outcomes, costs of organizational resources dedicated to run the ES, number of applications replaced / introduced, changes in staff requirements, and changes in business processes, due to the introduction of the ES.

**Information-Quality** is concerned with such issues as the relevance, timeliness and format of reports, and the accuracy of information generated by the ES. Here the focus is on the quality of the ES outputs; namely, the quality of the information the system produces in reports and on-screen.

**System-Quality** of the ES is a multifaceted construct designed to capture how the system performs from a technical and design perspective. System-Quality aspects include commonly cited quality measures, e.g. consistency of the user interface, ease of use / ease of learning, quality of documentation, and the quality and maintainability of the program code. System-Quality also refers to the goodness of the ES functionality, and sophistication and integration of the system.

### 4.2 Impact/Quality Protocol

The 4 model dimensions represent distinct but related measures of the multidimensional phenomenon – Information Systems Impacts (IS-Impact). When evaluating an ES, measures of these dimensions represent a ‘snapshot’ of the organization’s experience of the ES as at a point in time. The ‘impact’ dimensions (Individual & Organizational) are an assessment of benefits [positive impacts] that have followed (or not) from the system. The ‘quality’ dimensions completeness of the resultant over-arching, second-order measure of ESS.

The model was next tested at Queensland University of Technology (QUT) through confirmatory factor analysis of 157 survey responses regarding their ORACLE Financials systems. Based on LISREL model ‘fit indicators’ for 4 alternative models, good fit was indicated for all models, with the model above having the best fit with the data. All statistics indicated strong construct validity and reliability.
(Information & System) reflect future potential. Together, the four dimensions reflect an ostensibly 'complete' view on the Enterprise System – an over-arching measure of ES-Success.

While individual dimension scores are valuable, it is observed that treating one or a subset of the four dimensions (or variants) as a surrogate for over-arching success can be highly misleading. In example, a system can demonstrate very high quality, yet not be commensurate with excessively high related costs. Alternatively, the organization may have eked substantial benefits from the ES investment in the short term, but now be faced with inflexible ‘e-cement’, of a low quality, portending small or negative future impacts.

Knowing where you are at with your ES in terms of both Quality and Impact can provide valuable guidance on what actions to take. Lo-Quality/Lo-Impact is of course cause for serious concern, and probably a major re-think of the system. Lo-Impact/Hi-Quality suggests potential for harvesting substantial benefits, and a need to insure advantage is gained from the quality achieved. Hi-Impact/Lo-Quality may have been strategic in the short-term, but investment must now be made in raising the system quality if future gains are to be realized. Hi-Quality/Hi-Impact is the ultimate goal, the objective now being to maintain quality and to continue reaping positive impacts from the ES.

4.3 Our Research Credibility

The constructs and measures of the IS-Impact approach derive from the most complete and comprehensive ES impacts measurement study to-date, and the 1st validated instrument to gauge Enterprise System impacts published in the IS academic literature. We are seeking to capture IS-Impact simply and pragmatically using only four dimensions, at the same time, our approach is sophisticated and holistic sufficiently to suffice the need of measuring ES across time, key-user groups, departments and applications. Our research efforts are always designed for fulfilling the real needs of practitioners. We have established strategic partnership with several industry leaders and our research results have served as working tool and valuable intellectual assets by them. For instance, based on our previous research findings, Accenture, the world-leading management consulting company, has presented an Enterprise Resource Planning assessment tool to help their custom with high performance consultancy (please refer to E and the attached Accenture brochure).

5. ABOUT THIS RESEARCH PROJECT

5.1 Research Aim

A key aim of ITPS Research Program is to develop aids for benchmarking Enterprise Systems in order to better manage life-cycle costs, the management of which has been of long-standing interest to organizations. The IS-Impact track aims to develop the most widely employed model for benchmarking information systems in organisations for the joint benefit of research and practice. The proposed project purpose to:

- Identify the dimensions and measures of Information Systems Impacts (IS-Impact)
- Customize the measurement model in _____________________ research setting
- Develop a standardized instrument for measuring IS-Impact
• Develop an understanding of the state of ES using descriptive/comparative statistics in [ORGANIZATIONS]
• Identify key-user-group and understand the critical facets relevant to each key-user-group in [ORGANIZATIONS].

5.2 Research Methods

The proposed project will commence with a brief contextual study of ES in [ORGANIZATIONS]. Subsequently two survey rounds will be conducted in order to measure the IS-Impact in organizations and two survey instruments will be designed to fulfil objectives at each project phase. The first survey “identification survey” attempts to identify maximum applicable IS-Impact dimensions and measures for sample organizations. The second survey “confirmation survey” is then developed to verify the credibility of dimensions and measures identified in last survey, ultimately yielding a complete but economical measuring model and instrument to effectively gauge IS-Impact.

Step -1 Contextual study : Time 2 weeks

The context study aims to extend the understanding of the sample organization/s and its application. The information needs to be identified relating to:
• Core processes of target organizations;
• Management structure, number of employees and geographical span of the organizations…..
• Details of ES in the target organizations: a)numbers of ES applications; b) numbers of modules, c) the evolution course of ES implementation in the organization;
• Any prior evaluations of ES in the organization.

Method: Focus group; face-to-face interview, archival study

Expected outcome: A report of the state of ES usage and implementation in sample organizations.

Step – 2 Identification Survey : Time : 4 weeks

The purpose:
• To deliver a revised IS-Impact model and instrument having face validity and qualitatively validated through the contextual study and identification survey, ready for operationalisation for the subsequent confirmatory phase
• To initially identify the key-users of ES applications in sample organizations

Method: Web-based survey and mail the respondent with questionnaire attached; face to face survey.

Instrument: Please see the Appendix A: the template questionnaire for identification survey.

Who to be expected participant: All employees in ES-using [area] should be involved.

Expected outcome: A draft of customized IS-Impact measurement instrument for sample organizations and a-priori IS-Impact measuring model for QUT academic purpose.
Step 3: Confirmation Survey : Time: 6 weeks

The purpose:

- to operationalize the IS-Impact items identified in the last round identification survey
- to classify the key-users groups associated with the usage of ES applications
- to yield a customized IS-Impact measurement instrument for [ORGANIZATIONS] and an IS-Impact model for academic purpose.

Method: Web-based survey and mail the respondent with questionnaire attached; face to face survey.

Who to be expected participant: All employees in ES-using [area] should be involved, especially who have involved in identification survey.

Expected outcome:

- An IS-Impact measuring instrument to help organizations with benchmarking their ES across time to time.
- A report of IS-Impact of ES in sample organization. A template report please refer to Appendix B, moreover, we can provide you any other information of your IS success on your demand.

Step 4: Final Report Preparation: 6 weeks

6. ROLE AND RESPONSIBILITIES

Our role

- We will provide and conduct a detailed, economically and controllable research tailored for measuring IS-Impact on your organization.
- To provide and conduct a survey with the questionnaire.
- We will do first-hand data collection, coding, cleaning along with the project and analyse the data with cutting-edge research tool to yield valuable IT management information benefiting your future ES investment and management.
- We will provide you a copy of the data collected.
- We will provide you with a copy of the final report and related academic document, like the academic paper published, doctoral thesis etc.
- The whole project was supervised under full-experienced experts and renowned academicians in the fields of IS Impact Measurements.

Your role (the organisation role)

- To grant access to your organisations and to facilitate data collection.
- To grant access to respondents and provide incentives for their response.
- To grant us permission for usage of the data collected for academic publication purposes.

Agreement

Agreement Need to be signed between your organization and ITPS. Copy of Agreement is attached here with.
Confidentiality
The detailed information collected will be confidential to ITPS (QUT). No names will be used for reporting purposes. Neither QUT nor any other party will receive a copy of the response database. If you have any concerns regarding the ethical conduct of this research, please contact the secretary of the Queensland University of Technology’s human research ethics committee on (07) 3864-2340 or email w.heffernan@qut.edu.au.

7. DELIVERABLES
- We will provide you with a copy of the final report describing the state of [ES APPLICATIONS], the key-user-group characteristics and other descriptive findings from the survey (please refer to appendix B for the template report)
- We will provide you a presentation on data analysis/analysed data/findings
- Soft copy of final theses for your library purpose.

8. CONTACT
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Telephone 61 7 3864 9391
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Appendix C The Mandarin version of Package

企业管理软件影响力因子研究建议书
澳大利亚昆士兰科技大学
信息技术与信息服务研究中心
与
中国人民大学商学院联合研究项目

项目介绍:
在过去几年中，你们公司在管理软件上进行了大量投入，而该系统的影响力已经渗透入了公司各部门经营管理的各个层面。但是仍然有一些问题不断被提出，困扰着企业信息化管理工作：

- 您的管理软件是否帮助您取得项目上马之前设定的管理目标？
- 您的管理软件是否提高了企业的效益？
- 您的员工是否满意这套软件，并且加强了个人工作的效率？
- 到目前为止，这套管理软件对公司带来了什么影响，哪些是正面的影响，是否有负面影响存在？
- 如果希望继续深化使用这套管理软件，公司可能遇到的瓶颈在哪，是软件本身还是公司的IT管理？

……

由于管理软件的自身的复杂性，以及信息化管理的高难度，如何回答上面这些问题，以及如何准确客观的测量管理软件对企业带来的影响，一直是一个悬而未决的问题。另一方面，当企业实际着手评判管理软件对企业影响力时，往往发现难以找到一个标准的尺度，即一套对企业管理软件及其管理水平进行科学评测的指标体系和评价方法。为了回答上述问题，我们企业信息系统影响力研究小组诚邀公司参与我们的研究调查，只要贵公司已经安装并使用管理软件（财务软件，ERP套件）1年以上，您的意见和参与对于此项目研究均具有宝贵价值。此项‘企业管理软件影响力因子’研究项目为澳大利亚昆士兰科技大学，信息技术与信息服务研究中心（IT Professional Service Program, Queensland University of Technology, Brisbane, Australia）与中国人民大学商学院联合研究项目。

项目目标:
该研究项目管理目标为

- 深入研究中国管理软件市场，以及管理软件给中国企业带来的影响力，为企业管理者提供一个全方位的信息系统管理视角，并帮助企业管理者在进行未来更加有效的IT投资。
- 构建一套适于中国国情，体现中国企业信息管理特色，充分本地化的‘企业管理软件影响力评价指标体系和方法’，为中国企业衡量管理软件使用效率和效果的提供一套科学化和标准化的体系、方法。
- 深入研究中国企业内部的管理软件使用者类别，属性以及用户使用行为。

您的企业在此项目将获得的收益有：
• 帮助您了解贵企业内部管理软件的使用情况，使用用户类别，以及不同种类用户各自的满意度。
• 从系统质量和系统影响力两方面，对贵公司当前企业信息系统进行量化评估。
• 通过深入调查分析，结合贵企业信息化管理实际情况，为您提供一份管理软件影响力因子列表。
• 帮助您获取全方位信息系统管理视角，探究目前信息系统管理的瓶颈所在，并提供相关改进意见。
• 在项目最后将为您企业提供一份可重复使用的，标准化的信息系统评价体系，帮助您日后有效的比较，监督信息系统的使用。

研究方案与步骤:

项目特点：
此项目方案严谨并兼顾经济性，仅占用受访公司极少人工资源和时间。所有问卷采用无纸化调研方法，或者采用网页式调研方法。此次研究项目在贵公司可作为一项低费用/零费用 IT 管理咨询项目开展

研究方案：
此研究项目包括两轮问卷调查，调查对象为贵公司中管理软件的所有使用者（直接使用该软件系统，或者使用系统输出数据、相关报告）。

第一轮问卷调查目的在于深入并广泛的了解管理软件对贵公司的员工个人工作，部门运作和公司整体经营所产生的影响力，调查对象对该软件使用和感受进行深入思考，并且给予我们尽可能多的见解。在第一轮问卷调查后，我们将对所有问卷调查参与者提供的信息系统影响力进行分析与总结，提炼出一套信息系统影响力的评测指标，并将其放入第二轮调查。之后，我们将邀请您公司参与第二轮问卷调查，请您帮助我们对这些影响力评测指标的重要性进行打分和排序。

对公司提供合作与支持的期望：
希望贵公司能够提供进行问卷调查的便利，通过您的企业内部邮件系统向员工发布研究问卷。同时希望您协助我们进行问卷的回收工作，并鼓励，监督您的员工高质量的完成问卷。这些合作都将在贵公司与我研究小组签订保密协议之后开展。本研究纯粹出于学术研究目的，不带有任何盈利或者商业目的。

关于研究者：
此项目的研究机构之一 ITAPS，一直致力于“构建跨越信息技术生命周期的高效信息服务商业模式”的研究，其中“信息系统影响力评测模型构建”是我们的重点研究课题。从 90 年代晚期，ITAPS便投入此课题的研究，并且持续在国际顶尖学术刊物及会议上发表研究成果，并成为信息系统成功与评测领域（IS Success/ IS evaluation）中全球领先的专业研究机构，目前，ITAPS 将该项研究延伸到多个国家，旨在构建服务于不同经济文化背景下的信息系统影响力评价模型与指标体系。昆士兰科技大学是澳大利亚的著名高等学府，因其务实与开放的教学宗旨，以及贴近业界需求的研究活动而闻名。

项目领导者：
Professor Guy Gable (ITPS, QUT), in the large information system area, has 20 years of research experience. Before joining the faculty, Professor Guy Gable worked as one of the few senior consultants in the IT consulting industry. He先后任职于全球著名咨询服务机构 Ernst & Young (安永)加拿大分部，以及 Price Waterhouse Urwick（普华永道）悉尼分部。Professor Guy Gable 于英国University of Bradford 获得博士学位。


此研究项目中，其他成员均具有管理信息系统领域的博士学位或者目前作为博士候选人。
Appendix D. The Identification Survey Instrument

赛科 SECCO SAP 系统影响力调查
Impacts of SAP in SECCO

a survey conducted by the
School of Business, Renmin University of China
in cooperation with the
IT Professional Services Research Program (ITPS),
Queensland University of Technology

中国人民大学商学院

与中国

澳大利亚昆士兰科技大学

信息技术与信息服务研究中心

联合研究项目

问卷指导 General Instructions for Completion

研究项目介绍：在过去的几年中，赛科在 SAP 系统上进行了大量投入，而该系统的影响力也已渗透到了公司各部门经营管理的各个层面。我们企业信息系统影响力研究小组诚邀赛科所有的使用 SAP 系统或者 SAP 系统输出数据、相关报告的员工参与此次调查研究，只要您的日常工作内容和 SAP 系统相关，您的意见和参与对于此项研究均具有宝贵价值。

Introduction: Over the past few years SECCO have invested significant resources in the SAP system. The impact of the SAP system is now being experienced across all levels of most departments in SECCO. All employees in SECCO who use the SAP system or who use its direct outputs are contacted and encouraged to participate in this survey.

研究目的：此次赛科 SAP 企业信息系统影响力调查由中国人民大学商学院与澳大利亚昆士兰科技大学信息技术与信息服务研究中心联合进行。本次问卷研究旨在探寻 SAP 系统在您公司中产生的影响。我们希望了解您对该系统的意见和使用感受，因为您的意见和使用感受将有助于赛科确定目前以及未来的工作重点。我们欢迎您在此次调查中对 SAP 的使用效果畅所欲言，对于您在 SAP 应用方面的成功经验，赛科将进一步深入研究并加以推广；对于您所观察到的现有 SAP 系统的不足之处，则将被加深入分析和研究，为赛科日后的改进系统提供参考。

Purpose of the Survey: The purpose of this survey is to identify the impacts of SAP in your company. This survey is being conducted by the School of Business at Renmin University of China in cooperation with the IT Professional Services Research Program (ITPS) at Queensland University of Technology (QUT). We seek to learn from your experience with SAP in your company. Insights into your experiences with SAP will be valuable in highlighting where SECCO should be focusing attention, today and in future. Analysis of negative impacts will provide the basis of strategies for improvements. Positive impacts may be replicated or extended in your department or elsewhere in SECCO.

研究方法：此项研究调查旨在找出 SAP 系统在赛科产生的影响 (包括 SAP 系统对您个人工作，部门运作和公司整体经营所产生的影响)，并生成一份 SAP 影响力因子列表。在问卷中，不要担心您提供的 SAP 系统的影响力是不是比较轻微或者不够重要，我们希望了解任何您观察到的 SAP 系统对您和赛科产生的影响。在此轮问卷调查后，我们将对参与者提供的信息系统影响力进行分析，提炼出一套信息系统影响力的评测指标。

Conduct of the Survey - This survey aims to produce a long list of impacts of the SAP system in SECCO. You are encouraged to be creative in your responses (do not worry if the impact you are suggesting seems small or less important - We wish to hear of all impacts).
保密政策：研究小组将对调查数据进行严格保密。我们不会将受访者的姓名输入分析数据库。在研究过程中，所有受访者的姓名都将由一个序号代替，而研究结果都将经过综合处理与加工后上报，任何研究结论都不会与受访者个人产生关联。研究小组不会向赛科及赛科任何部门透露原始数据和研究数据库。如果您对该项目研究有任何研究伦理方面的疑问，请咨询澳大利亚昆士兰科技大学人类研究伦理委员会秘书处。联系电更为 (+61) 07 3138 2340，或电邮 ethicscontact@qut.edu.au.

关于研究者：此项目是中国人民大学商学院与澳大利亚昆士兰科技大学（QUT）信息技术与信息服务研究中心（ITPS）联合研究项目。此项目的研究者之一 ITPS，位于澳大利亚，布里斯班，长期以来，我们一直致力于“构建跨越信息技术生命周期的高效率信息服务商业模型”研究，其中“信息系统影响力评测模型构建”是我们的重点研究课题。从 90 年代晚期，ITPS 便投入此课题的研究，并且持续在国际顶尖学术刊物及会议上发表研究成果，并成为信息系统成功与评测领域（IS Success/ IS evaluation）中具有领先水平的专业研究机构，目前，ITPS 将该课题研究延伸到多个国家，旨在构建适应于不同经济文化背景下的信息系统影响力评价模型与指标体系。昆士兰科技大学是澳大利亚的著名高等学府，因其务实与开放的教学宗旨，以及贴近业界需求的科研活动而闻名。

About the Academic Study Team: This study is an initiative of the IT Professional Services (ITPS) Research Program at Queensland University of Technology (QUT) – Brisbane, Australia, in cooperation with Renmin University of China. ITPS focuses on technology-lifecycle-wide 'business models for effective IT services delivery'. The evaluation of Information Systems Impacts is the main ITPS research focus. ITPS has been researching IS Impacts since the late 1990s, and is now established as a leading international authority in the area. Queensland University of Technology (QUT), a leading Australian university, is well known as 'a university for the real world' because of its close links with industry and its relevant teaching and applied research.

问卷填写方式：此次问卷调查大概会占用您 10-15 分钟的时间，请您回答问卷中所有问题，于 4 月 20 日之前以电子邮件附件的方式，将附有完整答案的问卷寄往以下电子信箱地址：lcao@student.qut.edu.au。如果您对于此次问卷调查有任何疑问，请联系我或者本项目研究助理曹岚。

General Instructions for Completing and Returning the Questionnaire – It will take you approximately 10-15 minutes to complete this questionnaire. Please answer all questions and return the completed questionnaire by April 20. Please return your completed survey instrument as an email attachment to lcao@student.qut.edu.au. If you have any questions concerning the questionnaire, please do not hesitate to contact Professor Guy Gable or his research assistant Lan Cao.

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Mobile: +61 404096411
第一部份  Section One
个人信息  Personal Details

请您填写以下个人信息:
Please enter the following demographic data.

<table>
<thead>
<tr>
<th>姓名</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>职位</td>
<td>Business Title</td>
</tr>
<tr>
<td>部门</td>
<td>Department</td>
</tr>
<tr>
<td>在赛科供职的开始时间</td>
<td>Dates commenced with SECCO</td>
</tr>
<tr>
<td></td>
<td>年 (Year) 月 (Month)</td>
</tr>
</tbody>
</table>

您使用最多的 SAP 模块
（请您只选择一个模块）
Please tick the SAP module you use most
(Please tick only one module)

- 财务模块 FI
- 财务控制模块 CO
- 物料管理模块 MM
- 人事模块 HR
- 工厂维护模块 PM
- 生产计划模块 PP
- 模块 SD
- 项目管理系统 PS
- 质量管理模块 QM
- 管理模块 WMS

您使用的其他 SAP 模块
（您可以选择多个模块）
Please tick other SAP modules you use
(you may tick more than one)

- 财务模块 FI
- 财务控制模块 CO
- 物料管理模块 MM
- 人事模块 HR
- 工厂维护模块 PM
- 生产计划模块 PP
- 模块 SD
- 项目管理系统 PS
- 质量管理模块 QM
- 管理模块 WMS

请用一两句话描述一下您的工作职责，并且请写下在您的工作中，任何与 SAP 有关的（直接的和间接的）活动。
In one or two sentences, please describe your current job role, and where applicable, any involvement you have had with the SAP system.
第二部份 Section Two  SAP 用户使用行为调查  SAP Usage Pattern

说明：在这一部分中，我们希望了解关于 SAP 系统的使用经验和使用习惯，请根据您 SAP 的实际使用情况填写以下信息。在第一题中，请您在相应的使用年限上打钩。在第二题与第三题中，请您选择 1 至 7 相应数字来反映您的使用习惯。越靠近 1 一端代表很少使用和不规律性使用，越靠近 7 一端代表经常使用和非常规律的使用。

The section asks for your experience level with SAP and your usage pattern.
In row 1, please tick the appropriate years of experience you have with SAP. In row 2 and 3, please indicate which level best describes your usage pattern, with level 1 being the least frequent/regular, level 7 being the most regular/frequent.

<table>
<thead>
<tr>
<th>SAP 使用经验</th>
<th>Years of Experience with SAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAP 使用频率</td>
<td>How often do you use SAP</td>
</tr>
<tr>
<td>不使用</td>
<td>Seldom/Little</td>
</tr>
<tr>
<td>经常使用</td>
<td>Often/Much</td>
</tr>
<tr>
<td>不规律/间断的使用</td>
<td>Irregular</td>
</tr>
<tr>
<td>经常规律/连续使用</td>
<td>Regular</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>使用年限</td>
<td>4 年 (Years) 或者 _______ 月 (Months)</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>7</td>
</tr>
</tbody>
</table>
第三部分
Section Three
赛科 SAP 系统影响力调查
IMPACTS OF THE SAP SYSTEM IN SECCO

说明：在这一部分中，我们采用开放式的调查方法，以引发您对信息系统影响力（使用效果）进行深入的思考，并给予我们尽可能多的意见。我们欢迎任何有关 SAP 的使用经验和建议。（Instruction: This question is intentionally left open ended to encourage you to identify as many impacts as possible. We are interested in whatever impacts you are aware of.)

1. SAP 系统已经在赛科安装使用了 4 年，您认为该系统对您的企业和您的个人工作产生了哪些影响？（这些“影响”可以是您观察到的 SAP 使用效果，给赛科带来的变化。这些“影响”可以是企业战略性质的或操作性质的，大或小，可以是正面也可以是负面……）

The SAP system has been installed in SECCO for four years. What do you consider have been the impacts of SAP in your company and in your work? (These impacts can be any results, consequences, changes or implications you have observed, be they strategic/operational, major/minor, positive/negative……)
2. 根据您的使用经验，请您对 SAP 系统的质量进行评价？

Please comment on the quality of SAP?
Appendix E. The coding protocol – Self-coding scheme

Self-Coding scheme

Terms of used in this coding scheme

1. **Category/construct:** Refers to main categories of IS-Impact emerged at the end of the inductive analysis, which are the highest level of concepts pertaining to the construct of ‘IS-Impact’

2. **Sub-category:** Individual measures used in each category, which are gradually emerged and inventoried during the inductive analysis. Sub-category is a low level of concepts pertaining to ‘Category’.

3. **Initial codes:** a short term or description simultaneously summarize and accounts for each IS-Impact citations. In first round of coding, the coder will name each IS-Impact citation with ‘initial codes’.

4. **Focused codes (family):** significant and/or frequent initial codes will be raised to ‘focused code’ when the researcher perceives those initial codes have analytical significance rendering the phenomenon of IS-Impact.

5. **Free codes:** The initial codes are perceived insignificant in terms of IS-Impact.

6. **General coding theme:** Refer to the four analytical bins facilitate the commencement of coding, which also inform the researcher the main emphasis of the inductive coding. The general coding themes are developed from (Benbasat and Zmud 2003)’s IS Nomological Net, including: IS Artefact, User/Usage, Impact of (using) IS Artefact and practice and capability associate with (using) IS Artefact.

Coding techniques used in this scheme

1. **Open-coding:** Sources include (Glaser and Strauss 1967; Strauss and Corbin 1998). Open coding is one of the essential idea of the ‘grounded’ approach originally advocated by (Glaser and Strauss 1967). In Open-coding, data are collected, written up, and reviewed line by line, typically within a paragraph. Categories, subcategories and
labels are generated emergently, and a list of them grows. The labels are reviewed and, typically, a slightly more abstract category is attributed to several relevant incidents or observations. Open-coding is the overarching strategy of this coding activity.

2. Initial coding:
Sources include (Charmaz 2006).
Initial coding is one of coding technique attributed to ‘Open Coding’. Initial coding is breaking down qualitative data into discrete parts, closely examining them, and comparing them for similarities and differences (Strauss and Corbin 1998), naming them in concise terms, and proposing an analytic handle to develop abstract ideas for interpreting each segment of data (Charmaz 2006). Initial coding is always used as a First Cycle, open-ended approach to coding data (Saldana 2009). In this inductive coding, initial coding is applied as the primary technique in the first round of data coding.

3. In vivo coding:
Sources include (Glaser and Strauss 1967; Strauss and Corbin 1998; Charmaz 2006; Saldana 2009)
‘In vivo’ s root meaning is ‘in that which is alive,’ and as a code refers to a word or short phrase form the actual language found in the qualitative data record, “the term used by participants themselves (Strauss and Corbin 1998) P38”. In vivo coding is the primary technique during this initial coding, which will help the researcher retain as much as original observations from participants while conducting conceptualization job.

4. Focused coding:
Source include (Charmaz 2006).
Focused coding follows initial coding. Focused coding searches for the most frequent or significant initial codes to develop ‘the most salient categories’ in the data corpus and ‘requires decisions about which initial codes make the most analytic sense’(Charmaz 2006). In this coding scheme, focused coding is applied to identify the salient codes and concepts after initial coding, and then facilitate the research to develop solid sub-category and category of IS-Impact.

5. Pattern coding:
Source include (Miles and Huberman 1994)
Pattern coding is a way of group a large sum of data into a smaller number of sets, themes, or constructs. This coding pull together a lot of material into a more meaningful and parsimonious unit of analysis (Miles and Huberman 1994). The application of pattern coding is served as a general guides which keep the overall coding on the right track of answering research questions and dealing with research problem of this study. The inductive coding starts and surrounds four general coding themes, and all initial codes will be brushed into the four domains for further coding, comparison and analysis.

**Rule of thumb of this inductive coding**

This scheme documents a self-coding process and bottom-up fashioned qualitative analysis. The analysis commence with very context specific raw data, after three round of inductive coding, the large amount of data gradually being consolidated and transformed into a small set of highly generalized categories/sub-category.
1. Open-coding (Strauss and Corbin 1998): using an inductive and grounded approach to discerning meanings from data set. This coding activity is open to any analytical results.

2. In-vivo coding (Charmaz 2006): in the initial coding, try to use ‘In-vivo codes’ as much as possible to describe meanings of each IS-Impact citations. The advantage of ‘in vivo codes’ is to retain meanings and nuance of the data, and preventing analyser from early theorizing leaps which lead to unsolid analysis results and analytical holes.

3. The unit of analysis is this coding is ‘key concept’. The respondent’s paragraph will be decomposed to meaningful IS-Impact citations. Each IS-Impact citation describe single ‘domain’ of IS-Impact.

4. Coding on the Mandarin, as the data collected in Mandarin.

5. Synchronize the coding process in Nvivo software for a better organization and review. Nvivo is favourable due to its structural presentation of coding results.

**Coding Procedure**

1. preparation for data coding
2. open coding raw data
3. constructing a tentative focused codes family
4. modifying and maintaining the tentative focused codes family
5. reliability check of the inductive and self-coding results

**1. Preparation for data coding**

*Purpose:* Clean-up and sorting raw data into a form that is ready to code.

*Results:* decomposing IS-Impact citations from respondents’ paragraph

I) Reading through respondent’s paragraph to get a overall understanding of the data set.
II) Translating Mandarin into English literally.
III) Assigning a sequence number to each participant’s paragraph for the ease of data revision.
IV) Decomposing respondent’s paragraph into IS-Impact citation. One IS-Impact citation include an explicit anchor pertaining to one ‘key-concept’ of IS application, outcome of the application etc. Assigning running numbers to each IS-Impact citations for the ease of locating specific data bit.
V) Print every 20 citation into a spread sheet. The researcher can add columns flexibly to record each step of coding during the multiple round of analysis.
VI) Synchronize the citations in NVivo software, for a better data organization and review.

*Coding deliverables:* A list of IS-Impact citations in both Mandarin and English, stored in NVivo, Spreadsheet and Print-out

**2. Open coding raw data**

*Purpose:*
- Discerning meanings of IS-Impact citations
• transforming IS-Impact citations into a more manageable and accessible form.
• Deducting a large amount of IS-Impact citations into a number of descriptive codes – initial codes

Results: Constructing a list of initial codes from data set

Techniques: Initial coding; Pattern coding

Coding process:
I) Commence with any spreadsheet page containing a sample of 20 citations
II) Applying initial coding to each citation: generate an initial code (analytical tag) to each IS-Impact citation. Using In vivo codes as much as possible to retain the nuance of data.
III) Applying pattern coding: brush initial code (analytical tag) into four general coding themes in order to create a list of initial codes for each general theme.
IV) Consolidating initial codes as context free codes. Context free codes are easy for further comparison and generalization.
  • Standardizing the codes wording: compare initial codes and combine codes pertaining to exactly same issue but in different wording. For example, initial code of ‘improve working efficiency’ and ‘enhance individual productivity’. The researcher consolidates them into the code of ‘enhance individual productivity’ while black out the other initial code.
  • Removing description of value. For example, the code of ‘very slow system response’ is modified as ‘system response time’.
  • Constructing codes in a neutral statement. For example, the code of ‘better decision making’ is modified as ‘decision making’.
V) Repeat step1-3, until each citation in the spreadsheet page has been open-coded and pattern-coded.

Coding deliverables: an inventory of initial codes associating with general coding theme.

3. Constructing a tentative focused codes family

Purpose:
• Condensing IS-Impact citations into more abstract concepts – focused codes
• Identifying the most significant and frequent initial codes and raise them into focused codes

Results: Constructing a provisional focused codes family.

Coding Technique: focused coding

Coding process:
While a couple of spreadsheet page are open-coded, a sufficient long list of initial codes has been accumulated. The coder can revisit temporary codes and decide focused codes that make most of analytical sense to the data.
I) Open four new spreadsheet pages, each accommodate contents of one general coding theme, for instance, paste initial codes and citations related to IS Artefact in the page of ‘IS Artefact’.
  • Constructing focused codes
    1. identify initial codes that appear frequently
2. identify less frequent but significant codes: significant means:
   1) relevant to the specific context of study;
   2) Commented as critical issues by specific respondents.
3. upgrade frequent or significant initial codes into focused codes
   - Focused codes list is not static. Provisional focused codes would be removed, relocated, and modified according to further evidence. The rest of initial codes would be upgrade to focused codes when more data inscribed their significance.

Coding deliverables: a provisional framework consisting of focused codes and active initial code. The provisional framework is ready for further evolvement and maintenance by sifting the rest of citations.

4. Modifying and maintaining the focused codes family

Purpose:
- Using provisional focused codes coding the rest of IS-Impact citations.
- Condensing a large amount and unstructured qualitative data into abstract concepts.

Results: A data-driven and generalized categories pertaining to phenomenon of IS-Impact in China.

Coding technique: Initial coding, focused coding

Coding process:
I) apply initial coding to rest of IS-Impact citations according to step 2 (I)-(IV)
II) compare the initial codes and relevant data bits with provisional focused codes family:
   - Tap new initial codes and associated data bit to suitable focused code.
   - When no provisional focused codes fit this bit of data, create the new initial code as a new focused code
III. Maintaining provisional focused codes while the constant comparison between new data and well-coded data bit.
   - A focused code will be divided into a couple of sub-codes when it become compound.
   - A couple of focused code will be merged as a more concrete one when they pertain to same IS-Impact issue.
   - A focused code will be redefined when its boundary and content are expanded or narrowed down.
III) Repeat steps 4.(I) to 4. (III) until all data are coded into focused codes family and free codes.

Coding deliverables: a focused codes family is a group of data-driven and generalized categories pertaining to phenomenon of IS-Impact in China. The family codes will go through ‘theoretical coding’ for constructing IS-Impact sub-category and IS-Impact category.

5. Reliability check of the inductive self-coding framework

Purpose: check and examine the reliability and validity of the inductivity analysis. Enrich and consolidate this framework by consulting extant literature.
Exercise:
1. Reliability check of the focused codes
   - Test the consistency of self-coding results: Take a sample of citation and jumble them. Map them to the latest focused codes. A high degree of the consistency of deductive mapping result might suggest the high degree of reliability of the inductive self-coding.
   - Comparing with extant model and framework, for instance, IS-Impact model, ES benefit framework. The high degree overlapping across several IS success measurement model suggested the validity of the inductive codes.
   - Consulting previous literatures in ES adoption and management. Those literatures will be used as extended evidence for context specific IS-Impact codes and issues.

6. Thoughts after coding
1. A very logical and structured qualitative evidence analysis process is an important contribution of the work. This scheme aids in self-coding process and self-reliability checking.
2. The self-coding delivers a set of highly generalised sub-category and category pertaining to the phenomenon of ‘IS-Impact in China’. This emerged framework can be compared to extant IS-Impact model. We then can tell
   - What are the dimensions and measures of IS-Impact model being aware most by Chinese participant?
   - What are the dimensions and measures of IS-Impact model absent in the Chinese IS-impact scenario and the interpretation? ‘Information quality’, being presented in D&M model and IS-Impact, but is not instantiated in Chinese context. Information are not important as 10 years ago, otherwise they are regarded as given of a goodness of IS…
   - What are the dimensions and measures of IS-Impact model emerged in the Chinese context but absent in other context, and the implication?
3. How can the self-coder ensure the coding reliability maximally?

Reference
Appendix F. The coding protocol – the double-coding scheme

Double coding protocol

Introduction

This purpose of this protocol is to assist colleague-coders and the supervision team with examining the reliability of the inductive data coding activity conducted as part of an ITPS study titled ‘Revisiting IS-Impact phenomenon in a Chinese organization’. This protocol should be read in conjunction with a coding-sheet, which lists a maximum of 404 citations used in the double coding.

The double coding activity is adapted from techniques for assessing reliability in Content Analysis (Krippendorff 2004). The objective of double coding is to test the stability and consistency of the coding process. The coding reliability is examined in the test-test form; namely, another researcher who is not involved in the initial coding is invited to map a random sample of citations into the developed codes scheme. The mapping results will be compared to previous results derived from the initial coding, and then the inter-coder reliability will be assessed. The underlying assumption is that, the agreement rates demonstrated by the double coding are indicative of the reliability of the coding process. An acceptable level of agreement will suggest a good degree of stability and consistency of the coding procedure and coding results.

The codes scheme

Initial coding identified 60 codes organised into 6 categories. The six categories are: 1) Individual Impacts, 2) Organization Impacts, 3) System Quality, 4) Information Quality, 5) User Quality, and 6) IS Support Quality.

Sixty is an unmanageably large number for double-coding. A subset of 21 of these 60 codes was chosen from across the 6 categories based on their frequency of citation; choosing those cited most frequently. In this protocol, each code is provided with a brief description and examples of citation.

Table 1 summarizes the 21 codes with frequency of citation in parentheses. Table 2 presents details of each of the 21 codes, including a short name of codes, a description of codes, and one or more examples of citations associating with codes.

---

8Literature suggested that dealing with a large number of codes will made coding decision very difficult. Restricting the number of codes below 20 will ease coding decisions yet feasible to verifying the reliability of coding process (Hruschka, D. J., D. Schwartz, et al. (2004). “Reliability in Coding Open-Ended Data: Lessons Learned from HIV Behavioral Research.” Field Methods 16(3): 307-331).

9(Burla, L., B. Knierim, et al. (2008). “From Text to Codings: Intercoder Reliability Assessment in Qualitative Content Analysis.” Nursing Research 57(2): 113-117.) indicates low-frequently cited codes are often narrowly defined and pose little challenge acquiring a high rate of coding agreement. Considering the employment less cited codes will over simplify the double coding, the double coding use the most cited codes rationally.
Table 1. The summary of codes

<table>
<thead>
<tr>
<th>Individual Impacts</th>
<th>Organization Impacts</th>
<th>System quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Ease to do work (72)</td>
<td>4. Information transparency (31)</td>
<td>7. System feature and functions (41)</td>
</tr>
<tr>
<td>4. Improve individual productivity (27)</td>
<td>5. Enterprise management optimization (21)</td>
<td>8. Ease to use (31)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10. System response speed (22)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Information quality</th>
<th>User Quality</th>
<th>IS Support Quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Data availability (16)</td>
<td>15. User system dependency (9)</td>
<td>18. End user training (16)</td>
</tr>
<tr>
<td>12. Data integration (10)</td>
<td>16. Breadth of system usage (User’s task) (9)</td>
<td>19. Regular maintenance (9)</td>
</tr>
</tbody>
</table>

Coding rules

Coding rules are intended to guild the activity of citation mapping in the double coding. Three criteria were established to map the citations into the codes. Coders should regularly consider the criteria during the mapping.

1. Mutual exclusivity is the primary criteria when mapping citations into codes. The citations have been designed to be singular. One citation should be mapped into one code. Multiple mapping is not allowed. When more than one code is considered relevant to a citation, the coder is required to determine the most-suitable code to accommodate the citation.

2. Relevance of code: Citations should be mapped into the most relevant code. If coders encounter difficult citations which are considered irrelevant to any existing codes, please record them in table 3. These unmapped citations will be reviewed and discussed after the double coding.

3. Constant comparison is the fundamental to double coding. When coding the citations, the coder should regularly consider the short description of each code, regularly reference the example citations presented, constantly compare the meaning of the citation with the content of codes, and ultimately decide the dissemination of the citation.

Coding procedure

Prior to the double coding, supervision team should choose a random sample of 100 citations listed in coding-sheet and highlight the chosen sub-set of

---

10 Lombard, Snyder-Duch, and Bracken (2004) suggested that the appropriate size of sample should not
citations in the coding-sheet. Coders only perform double coding on this sub-set of citations.

1. Reviewing the codes scheme (table 2 A-E) before you start any coding.
2. For each Starting with the first citation in the coding-sheet, review that citation until you comprehend its meaning. Please deal with the citation one by one. The citation is presented in normal text. The complimentary words in parentheses are to make citation more readable and comprehensive. In some other cases, information in parentheses provides neighboring texts of the citation, in order to convey the overall meaning of the singular citation.
3. Going through the codes scheme. Comparing the citation with each code according to short descriptions and examples of citation. Regularly considering the coding rules while you are coding citations
4. Determining the most suitable code for the citation.
5. Writing down the codes’ number in the column of ‘number of code’ of the corresponding citation in coding-sheet.
6. If encountering a difficult citation which is hardly mapped to each code, coder should record the sequence number in Table 3.

Coding example

<table>
<thead>
<tr>
<th>No.</th>
<th>Codes</th>
<th>Short description</th>
<th>Example citations tapped into this codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ease to do work</td>
<td>The extent to which the SAP system simplifies, facilitates, and brings convenience to individual daily work.</td>
<td>46.174. 方便进行有关分析。Convenient to apply relevant analysis 82.303. 便于查询（检修）记录。Easy to query (maintenance) record 111.409. 有利于化学品的月结工作，facilitate monthly calculation of chemical material</td>
</tr>
</tbody>
</table>

An excerpt of coding-sheet

<table>
<thead>
<tr>
<th>Number of code</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>185. 1</td>
<td>77. 290. 我觉得 SAP 系统很不错，较方便 (工作人员) 查询和操作。 (SAP is good. It facilitate the data query and other working)</td>
</tr>
</tbody>
</table>

be less than 10% of the full data set to capture variations in a reliability test. Lacy and Riffe (1996) suggested that a larger size of testing sample should be utilized if the acceptable minimum level of agreement is low (<85%). Considering the inductive and grounded approach of the study, it is decided the acceptable agreement rate is 70%. Thus, a considerable large testing sample, namely, 100 citations is used in the double coding, taking up 15% of the total data set (630 citations), and 25% of the group of 404 citations yet coded into the 21 codes.
This excerpt describes that the enterprise system (SAP) assists the users in an easier (data) query and operation. The excerpt is concerned with a positive effect of SAP on individual user, whose daily work and operations, such as data enquiry, is simplified and become easy due to the involvement with SAP. Hence, the code of ‘Ease to do work’ accounts for this citation and the citation are mapped into this code.
Appendix G. The unmapped Citations in Inter-coder Reliability Test

Comparison of the two round of coding reveal a inter-coder agreement of 72%, well in line with the guideline of (Krippendorff 2004), who indicate a minimum agreement rate of 70% as acceptable measure of reliability. A work shop has been set up after double coding. Coders discuss the unmatched citations and codes with significant discrepancies until consensus on the mapping is reached.

Of the 28 missed citations, 24 citations were coded into different codes by two coders. The participating coder suggested that 4 citations were too difficult to map each of codes. Coders achieve consensus on the final decisions of the 28 missed citations during the workshop and the agreement on mapping raise to 90%. 18 citations remain in the original codes, 5 citations were relocated into other codes, the rest of 5 citations are decided to remove from the analysis as they are either too general or too compound to fulfill the analysis goal.

### Unclear and compound citations

<table>
<thead>
<tr>
<th>No.</th>
<th>Initial coding</th>
<th>Double coding citations</th>
<th>Reason for disagreement between coders</th>
<th>Final decision of mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Easy to do work</td>
<td>Data availability</td>
<td>134.550. 维护作业经常需要了解备件,有（时难找到 Plant maintenances need to know the status of spare parts, but it hard to find (information that I need.)</td>
<td>Compound citation: easy to do work or ease to use system</td>
</tr>
<tr>
<td>17</td>
<td>data availability</td>
<td>system features</td>
<td>106.381. 通过此系统的使用,个人认为较好,可以记录所有的检修项, I consider that SAP is a good system after using it for a while. It can record each repair activities</td>
<td>Compound solution, can fit both codes.</td>
</tr>
<tr>
<td>23</td>
<td>regular maintenance</td>
<td>system reliability</td>
<td>55.201. 使用质量可以，但是在持续改进过程中, the quality is good and consistent improving</td>
<td>Blurry citation cant fit into either of code</td>
</tr>
<tr>
<td>27</td>
<td>knowledge</td>
<td>67.599 本人使用的权限有限，在此基础上</td>
<td>My mistake, not related</td>
<td>Unmapped citation</td>
</tr>
<tr>
<td>retention</td>
<td>上认为 SAP 系统较好。Based on my experience with SAP, I sense it is running well.</td>
<td>to ‘knowledge retention’</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------</td>
<td>------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Easy to do work</td>
<td>Ease to use system</td>
<td>6.24. 快捷 fast and convenient</td>
<td>Blurry citation</td>
</tr>
</tbody>
</table>

**Consensus on unmatched citations**

<table>
<thead>
<tr>
<th>No.</th>
<th>Initial coding</th>
<th>Double coding citations</th>
<th>Reason for disagreement between coders</th>
<th>Final decision of mapping</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Easy to do work</td>
<td>Ease to use system</td>
<td>24.94. 感觉很方便。and make our work convenient.</td>
<td>Need contextual information, recode to ‘ease to do work’</td>
</tr>
<tr>
<td>2</td>
<td>Easy to do work</td>
<td>Ease to use system</td>
<td>39.153. (工作)更便捷 more convenient (to our work)</td>
<td>Recode into II</td>
</tr>
<tr>
<td>3</td>
<td>Easy to do work</td>
<td>Ease to use system</td>
<td>6.24. 快捷 fast and convenient</td>
<td>Blurry citation</td>
</tr>
<tr>
<td>4</td>
<td>easy to use system</td>
<td>Easy to do work</td>
<td>58.212. (系统)便于查询。Easy to make query (in the system)</td>
<td>Recode to II easy to do work, agree with Wenjuan</td>
</tr>
<tr>
<td>5</td>
<td>Easy to do work</td>
<td>business process optimization</td>
<td>12.41.简化了很多业务操作，A great many business operation has been simplified</td>
<td>Recode to II easy to do work, operation standardization</td>
</tr>
<tr>
<td>6</td>
<td>Easy to do work</td>
<td>141.518. 可以更好的利用 IT 技术为企业 的业务提供服务。I can provide better IT service to facilitate SECCO business.</td>
<td>Recode to II easy to do work</td>
<td>Easy to do work</td>
</tr>
<tr>
<td>No.</td>
<td>Statement</td>
<td>Code</td>
<td>Level</td>
<td>Translation</td>
</tr>
<tr>
<td>-----</td>
<td>-----------</td>
<td>------</td>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>7</td>
<td>Easy to do work</td>
<td>Data availability</td>
<td>134.550</td>
<td>维护作业经常需要了解备件,有时难找到 Plant maintenances need to know the status of spare parts, but it hard to find (information that I need.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Compound citation: easy to do work or ease to use system</td>
</tr>
<tr>
<td>8</td>
<td>information transparency</td>
<td>enterprise management optimization</td>
<td>15.54</td>
<td>SAP 系统已经在赛科安装使用后,企业各个管理层面能在 SAP 系统中及时了解企业经营情况, Each level of management would be informed of the state of PETRO’s business from SAP system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Recode to Info transparency</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td>38.149</td>
<td>正面：[有强大的数据库支持], 便于你了解当前公司的管理状况（你权限内的）; the positive impacts: [the powerful database] allows us to know current state of PETRO’s business and management (within users’ authority). (=&gt;38.632)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Recode in to info transparency</td>
</tr>
<tr>
<td>10</td>
<td>information transparency</td>
<td>system features</td>
<td>62.232</td>
<td>对于一些特殊问题的处理, 系统的权限设计需要根据企业实际情况进行修改和更新。 Regarding to some special scenario, user assess authorization should be revised and updated according to company’s actual situation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Recode to Infor transparency, as authorization management is included in the code.</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td>89.335</td>
<td>系统登录密码更新过于频繁, 且每次更新的密码都不能与前 5 次有丝毫的重复, 这样用户需要需要设置的密码 Might be ‘ease to use’, as the respondent comment on ‘the difficulties in password reset’.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Easy to use</td>
</tr>
</tbody>
</table>
就很多很多，时间一长，自己都记不清楚是哪个密码了，很烦很烦！建议一年或更长时间更新一次密码，且没有限制条件，这样使用起来方便快捷。The SAP password reset is too frequent and complicate. It require different password from the previous 5 times, in this case, users create so many passwords that he may get confused easily. This bothers me so much! I suggest that we should change password yearly or longer and no restrictive conditions, that would be easier and convenient.

<p>| 12 | information transparency | data availability | 9.33. (对信息的)获取都很便利 It is convenient to get access to (data by SAP) | Recode to easy to work | Easy to do work |
| 13 | enterprise management optimization | business process optimization | 73. 286. 使企业处于有序化的运行状态。Assisting in the orderly business operations in SECCO | Recode to enterprise management | Enterprise management optimization |
| 14 | business process optimization | enterprise management optimization | 109.393. 对于公司的管理来说是一个很好的平台。It is a very good business management platform for an enterprise. | Agree with Wenjuan, should map into ‘Enterprise management optimization’ | Enterprise management optimization |
| 15 | system features | regular maintenance | 42.164. 所以希望公司对客服团队操作的这块有所改进, I suggest modifying | Recode to system features, wenjuan | System feature |</p>
<table>
<thead>
<tr>
<th></th>
<th>component</th>
<th>description</th>
<th>score</th>
<th>context</th>
<th>citation</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>system reliability</td>
<td>system respond speed</td>
<td>49.582</td>
<td>Especially in acquiring a large body of specific data, the process outage and I was kicked out from system (current job was closed).</td>
<td>Recode to system reliability</td>
</tr>
<tr>
<td>17</td>
<td>data availability</td>
<td>system features</td>
<td>106.381</td>
<td>Through this system, I consider SAP is a good system after using it for a while. It can record each repair activities</td>
<td>Compound solution, can fit both codes.</td>
</tr>
<tr>
<td>18</td>
<td>data integration</td>
<td>Easy to do work</td>
<td>140.629</td>
<td>Sometimes let me think that we use this system simply because we need to provide data for (financial department deriving financial report)</td>
<td>Seem to be a compound solution, fit to integration/availability and easy to do work</td>
</tr>
<tr>
<td>19</td>
<td>data integration</td>
<td>information transparency</td>
<td>69.256</td>
<td>Makes inter-departmental and cross-departmental data transfer safely and securely</td>
<td>Code to integration</td>
</tr>
<tr>
<td>20</td>
<td>data integration</td>
<td>enterprise management optimization</td>
<td>57.589</td>
<td>Need contextual information, code into data integration</td>
<td>Data integration</td>
</tr>
<tr>
<td>21</td>
<td>breadth of system usage</td>
<td>Easy to do work</td>
<td>54.198. As a customer service representative, their role is relatively simple and low-level, corresponding to SAP in customer service daily usage should be simple and should maintain simplicity consistently. Other powerful functions in SAP should support the CSR or like an extra bonus, but not hinder CSR's regular work. (&gt;&gt;54.585)</td>
<td>Code to breadth of system usage</td>
<td>Breadth of system usage</td>
</tr>
<tr>
<td>22</td>
<td>user system skill</td>
<td>easy to use</td>
<td>120.447. It simplifies the storekeeper's job, I reckon that a labor worker can do it.</td>
<td>Agree to wenjuan, code to easy to use</td>
<td>Easy to use</td>
</tr>
<tr>
<td>23</td>
<td>regular maintenance system reliability</td>
<td>55.201. The quality is good and consistent improving</td>
<td>Blurry citation can't fit into either of code</td>
<td>Unmapped citation</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>computing infrastructure system respond speed</td>
<td>125.466. Now that it has been upgraded, the response speed has significantly improved since its update.</td>
<td>Need contextual infor, code into computing infrastructure</td>
<td>Computing infrastructure</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>individual productivity</td>
<td>66.243. 但有些操作程序也人为地降低了工作效率，影响了正常的工作进度。 However, some standardized operation decrease working efficiency, even affect normal working progress.</td>
<td>Individual productivity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>enterprise management optimization</td>
<td>110.398. 商业营运方面都起到了很大的预期效果。(Standardized operation has delivered expected impacts) on business management as well.</td>
<td>Enterprise management optimization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>knowledge retention</td>
<td>67.599 本人使用的权限有限，在此基础上认为 SAP 系统较好。Based on my experience with SAP, I sense it is running well.</td>
<td>My mistake, not related to ‘knowledge retention’ Unmapped citation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>knowledge retention</td>
<td>89.614 我估计原始的 SAP 用户流动很大，使用 SAP 的新手也不在少数。I guess the initial SAP user in SECCO has changed a lot and there are a great number of new users as well.</td>
<td>Knowledge retention</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Appendix H. the 60 focused codes

<table>
<thead>
<tr>
<th>Categories</th>
<th>Sub-category (Focused codes)</th>
<th>Citation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Quality</td>
<td>system response time</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td></td>
<td>System reliability</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td></td>
<td>system accuracy</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Features and functions</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technical integration of system</td>
<td>15</td>
<td>Re-specify as ‘system integration’</td>
</tr>
<tr>
<td></td>
<td>system security</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>powerful database</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>easy to use</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td></td>
<td>system sophistication</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td>easy to learn</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>well-translated system</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>System configuration</td>
<td>21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>extendable system</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>System self-service function</td>
<td>1</td>
<td>Mapped into ‘features and functions’</td>
</tr>
<tr>
<td>Information Quality</td>
<td>report format</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>report usability</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Report usefulness</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>information timeliness</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information availability</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td></td>
<td>information trustworthiness</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Individual Impacts</td>
<td>ease to do work</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td></td>
<td>operation standardization</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>information retrieval and awareness</td>
<td>9</td>
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**User/Usage**

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‘Information integration’ and ‘technical integration’ are combined into ‘system integration’ in SQ.

These two items are combined into ‘overall competitiveness’ in OI.

Mapped into ‘business decision’.

Revisit this item and re-specify it as a item of attitude-related quality in User Quality.

Re-specify it as an item of knowledge-based quality.

Revisit this item and re-specify it as a item of attitude-related quality in User Quality.

Re-specify it as an item of attitude-related quality in User Quality.

Re-specify this item as knowledge-related quality.

Re-specify this item as skill-related quality.

Re-specify this item as
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