User and Provider Perspectives on ES Engagement by Chinese SMEs: A Process Analysis

Zheng Xu, David H. Brown, and Mark Stevenson

Department of Management Science, Lancaster University Management School, Lancaster University, Lancaster, Lancashire, U.K.

Abstract - *The extant Enterprise Systems (ES) literature shows a great emphasis on Western large organisations, and the user perspective is considered prime. The survey method is dominant in this literature, focusing on what motivates an implementation and on the factors that are critical to implementation success. In the main such survey work treats ES implementation as an event with the analysis focused on input factors and outputs. In contrast, this paper examines ES adoption and implementation in Chinese SMEs by considering not only the user perspective but also the ES provider and the wider institutional setting. The use of the case study method captures the dynamics of the implementation process and the changing relationships between the stakeholders. Both actor network theory and institutional theory inform the analysis. The findings are potentially significant and challenge user-centered theories of adoption. The institutional influences are shown to be weaker than anticipated in China context.*

Keywords: Enterprise systems; SMEs; Case study; China; Institutional theory; Actor network theory.

1 Introduction

This research is designed to explore the experience of enterprise system (ES) adoption and implementation in Chinese small and medium sized enterprises (SMEs). The aim is to understand this experience from two perspectives – the user and the ES provider – both operating within a broader context of government policies, national and local. It is case based research and this paper reports the broad logic of the study and the findings from one of the four case studies.

As defined by Davenport [9], ES is a software system that imposes its own logic on a variety of aspects of an organization such as operations, culture and strategy, and which leads to a higher degree of integration and competitiveness. The research into ES is dominated by a Western oriented body of literature [12]. The situation for SMEs, both in developed and developing countries, is relatively under-researched. For example, in China, data released by Ministry of Industry and Information Technology indicates that between January to November in 2013 the ES sector software products generated revenue of CNY 911

billion (USD 148 billion) [22]. As more than 98% companies in China are SMEs a rapidly increasing proportion of this revenue is originating from this sector. Despite this importance research into the China context remains limited and is discussed later in the paper.

More generally research of ES in relation to SMEs in developing economies is problematic. Insights and assumptions from the study of large firms in developed countries are frequently applied to the research of SMEs in developing countries [5][7]. However, ES innovation is a highly complicated process, and the consequence of adoption and implementation is determined by complex interplays of involved stakeholders (e.g. user, ES vendor and government). To investigate this further in the specific context of Chinese SMEs the research set out to shed light on two questions:

❖ How do SMEs in China (and potentially other developing countries) adopt and implement ES?

❖ What roles do ES providers and governmental institutions play in the process?

Multiple-case study is employed as the research methodology. Four cases have been completed and the analysis is well advanced. For this paper one of the cases is selected to demonstrate both method and some key findings of the research. The distinctiveness of the research is potentially twofold:

❖ First this research employs process thinking to understand the chronology of events, rather than treating the adoption and implementation of ES as a single event. The chronology of events is graphically depicted as a flux of interactions between the main stakeholders

❖ Second the adoption and implementation is viewed from both the user and vendor perspectives in the context of wider institutional influences.

The paper is generally divided into 6 parts. After briefly introducing the research, literature review (2) is presented to elaborate the state of ES research and highlight relevant research gaps. Theoretical framework (3) is discussed thereafter to interpret the research concerns and guide the design of methodology (4). One example case is selected and the analysis and finding are presented (5). Discussion and some key findings form the conclusion (6).

2   Literature Review

The ES adoption and implementation literature is very large and beyond the scope of a single paper. The selected literature reviewed here is presented in two parts. First, the mainstream literature which is typically large firms in developed countries. This is important and influential research and an overview is presented here. Second, ES research in a China context, particularyy relating to Chinese SMEs.

2.1   ES Research on Large Firms in Non-China Context

In the area of ES adoption there are studies on motivators [1] and selection criteria [3] but there are many more on ES implementation. This comprises several sub-streams like implementation method, organisational fit, and implementation impact. For example, Berchet & Habchi [4] propose a five-stage model of ERP deployment; Scheer & Habermann [29] suggests business process re-engineering (BPR) to achieve a better organisational fit.

The study of critical successful factors (CSFs) remains the largest strand of research, addressing both adoption and implantation, but in virtually all cases the analytical focus is the concern of the user company [12], and embraces technological, managerial, and organisational concerns. Typical of this strand is the early work of Holland & Light [15] but there are many examples:

- ❖ A questionnaire research conducted in a group of Swedish and Finnish firms points out the critical role of IT competence, and suggests better collaborations between internal and external expertise to improve ERP system quality and information quality [16];

- ❖ Based on a comprehensive study on the critical success factors in the mass literature, "top management support", "ERP teamwork and composition", "project management", and "change management" are considered significant [27];

This rich Western based research on ES adoption and implementation is largely characterised by three perspectives introduced below.

User firm centred

Strong emphases are generally given to the perception of user Company, and user companies freqnently determine the research findings [3]. However, the user company is unlikely to be the only influential party since others such as ES vendor, ES consultants, government, etc. are also pivotal to ES adoption and implementation [6].

Dominance of survey based methods

The research into ES is heavily survey driven. Statistical data is then used as the basis for the analysis and the contribution [16]. However the statistical findings may have limited explanatory power. Surveys are especially open to challenge when based on single respondents, using factors identified as significant in prior research. Arguably, ES are complex IS and organisational systems and are context-dependent.

Event thinking

Treating ES as a 'product' that is selected and implemented as an event is commonplace e.g. the notion of organisational life 'before and after' ES implementation [1]. In reality, implementation of ES can be months and often years [28].

2.2   ES Research on Chinese SMEs

ES research in China context is heavily influenced by the dominant research phenomena created by Western literature in terms of research approach and strategy: survey-based and event-thinking [36]; firm-centred discussions [21]. Despite the similarities, Chinese firms also shown their unique experience of ES engagement [14]. ES implementation in China context is predominantly influenced by hierarchical power, and Chinese firms generally have passive attitudes towards ES innovation [33].

The ES research specifically targeting *Chinese SMEs* is scarce. Within the niche research area, most research intends to generalise findings from studies of mixed firm sizes [20]. In the China context (including Chinese SMEs) three characteristics emerge from the extant research that provide a point of comparison and reference to Western experience.

Limited resources

All SMEs are commonly recognised as resource constrained, including Chinese SMEs and possibly to a greater extent. Poor IT infrastructure, financial resources, inadequate staff competence and numbers, etc. have been identified as pivotal [18].

External influences

Unlike most Western experience the Government in China is more active in influencing ES adoption by issuing relevant policies or initiating national projects [14]. This is framed as the provision of a supportive environment (along with financial, education, training and infrastructure development, consultants etc.) to Chinese firms [34].

Cultural study oriented

The research of ES research in China context has shown a significant emphasis on cultural study. The study of Chinese culture is frequently considered as an effective way to guide the ES customization, and minimise issues of organisational fit [2]. Although understanding Chinese culture will reveal some behavioral tendencies regarding ES innovation, the cultural study arguably has limited explanatory power to the process of ES adoption and implementation.

2.3   Discussion

A clear characteristic of the extant research on ES adoption and implementation is the primacy of the firm centered user view. Other stakeholder perspectives are rare. Methodologically the survey dominates and often the variables (e.g. CSFs) are sourced from previous studies. Such

approach not only limits the exploration of CSFs, but also provides scarce explanations for the identified CSFs. Especially when the context is still under-explored.

Knowledge about the context of Chinese SMEs is even scarcer. Although the unique characteristics presented by Chinese firms (including SMEs) have been recognised, the significance of the context is inadequately explained in terms of implementation strategy and process, process of change management, interactions of stakeholders, etc [14]. A black-box effect has gradually been created. This is regrettable and limits the potential contribution to both theory and practice.

3   Theoretical Framework

Regarding the ES engagement in Chinese SMEs, the findings of literature review confirmed: the absence of contextual understandings; a dominance of survey, user focused and event based research; resource constraints; the influence of government agency; and cultural issues. Against this context the researchers identified two theoretical constructs frames that helped shape the empirical work and the subsequent interpretation of the findings.

Actor network theory (ANT) suggests that the social system is a hybrid system with various human and non-human entities, and they are equally important. Interaction and negotiation among the actants is the key of network construction, which also explains the innovation process [8]. ANT is employed as the main theory. Using the process of translation from ANT: problematisation; interresment; enrollment; mobilization [8], the interactions among the stakeholders, especially the interplay between user company and ES vendor, can be examined.

Institutional theory generally studies how the legitimacy, isomorphism, culture and all other forms of social forces would exercise the power to the organizations to change the ways they behave. Institutional theory is the second construct to capture the macro-level causalities of the ES engagement (e.g. Governmental influences and intervention) to endow organisational activities with richer meanings. With the emphasis on governmental polices, King et al. [17] in his seminal paper explores six types of institutional influence on IT innovation: knowledge building; knowledge deployment; subsidy; mobilization; standard setting; and innovation directives. The concept of institutional isomorphism proposed by DiMaggio & Powell [11] is additionally utilised to complement the institutional analysis for non-political concerns.

In our original study ANT and institutional theory are complementarily utilized as interpretive frames to explain the process of ES engagement and institutional influences. In this paper, however, the emphasis is given to institutional analysis considering the length limit. Figure 1 illustrates key elements of the proposed theoretical framework.
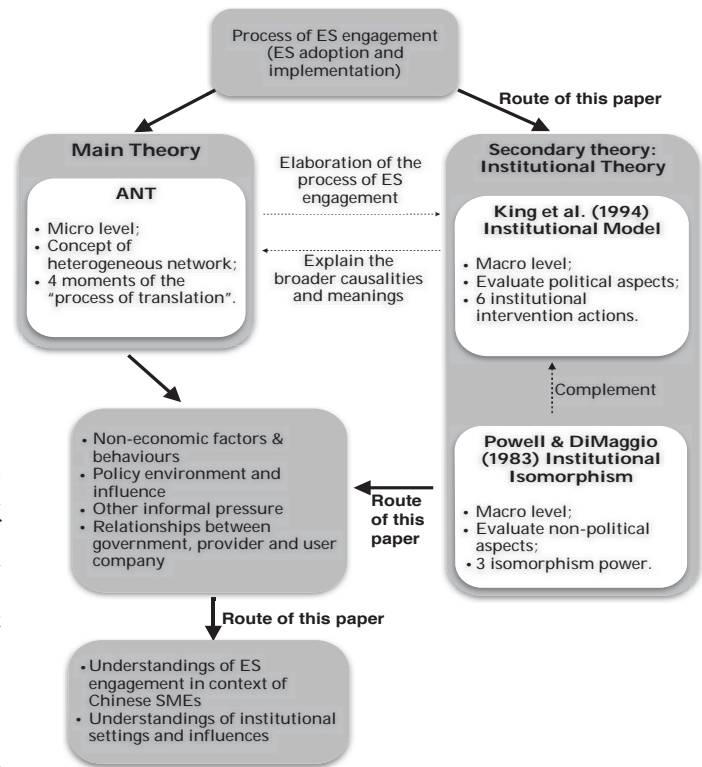

Figure 1: Theoretical Framework

4   Methodology

The discussions of literature point to the need for a research design based on a process approach, with multiple stakeholders and case-based was adopted. Thus multiple case study reserch is conducted to carry out exploratory studies where theoretical support is limited and enhance the reserach credibility [13][37].

Using the above principles, the empirical design was based on the selection of four SMEs (defined by the Chinese firm classification regulations), all in Shenzen, Guangdong Province. All firms are first time adopters, and ES providers' perspectives are included. For all the firms involved multiple semi-structured interviews were employed with interviews audio recorded where possible. Firm documentation where relevant was collected. Government personnel were included together with the collection of policy documentation.

Four company cases (A-D) are have been constructed, along with their respective software providers (X,Y). In this paper the focus is on user company A – Battery-Shell and its interactions with software provider X – GZsoft. Since the four cases are selected from the same city, the influences of local government are applicable to all of them. The overview of the four cases is shown in Table 1 with the selected example 'Battery Shell' in bold.

Table 1: Overview of the Four Cases

	(Case Example) User Company A – Battery-Shell	Other Cases: User Companies B, C & D
Turnover	**CNY 200 million (USD 32 million)**	Between CNY 12-40 million (USD 2-6.5 million)
No. of Employees	**420**	Between 15-260
Location	**ShenZhen City, GuangDong Province**	ShenZhen City, GuangDong Province
Software Provider	**ES Vendor X**	ES Vendor X or Y
Selected Modules	**1.General information;** **2.Order management;** **3.Production management (partially implemented);** **4.Procurement management;** **5.Stock management.**	Between 5-9 modules
Interviewees	**1.Vice general manager** **2.IT supervisor** **3.Production coordinator** **4.Procurement manager** **5.Software consultant (Vendor X)**	Between 3-5 interviewees (multiple interviews with each)

5   Analysis Case A: Battery-Shell

To reiterate, each case is constructed with perspectives of user company and ES vendor to offer a better view for the process of ES adoption and implementation. The approach to the analysis follows the theoretical framework in Fig 1. The section is organised into three elements: (1) profiles of company and ES vendor (2) overall timing and schema of the ES adoption and implementation process, and (3) government influence and intervention.

5.1   Profiles of Battery-Shell and GZsoft

Battery-Shell is a leading manufacturer that produces aluminum shells for lithium cellphone batteries in Shenzhen City, Guangdong Province, China. The company was established in 2002. Prior to 2008, the company had very limited knowledge of ES. But rapid growth put severe strain on the company's 'traditional' approach to management, hence the adoption of Enterprise Resource Planning (ERP) system in 2008.

The selected ES Vendor – GZsoft was established in Guangzhou city, Guangdong province in 1992, and it is one of the domestic pioneers developing and providing ES solutions. However, ES products are surprisingly not the main focus of its business, since GZsoft is also a training and employability provider in the disability sector.

5.2   Adoption and Implementation Process

Central to this process were milestone events and these are shown. The overall process can be divided into two continuous, and highly interactive, parts: adoption (up to the 12th Dec. 2008) and implementation (12th Dec. 2008 onwards).

5.2.1   ES adoption decision process

Pre-October 2008: Although Battery-Shell had prospered it had started to come under pressure from competitors (2006-2007). The company also suffered from a number of other problems related to growth, including high staff turnover, inaccurate stock management, and ineffective production plans. Based on some personal knowledge of ES acquired from a previous company, the Vice-General Manager (V-GM) recognised that the problems were linked to corporate management that cannot be easily solved by machinery upgrade, thus he decided to implement ES to standardise the company.

October 2008 to December 2008: The ES selection process was passive due to limited understanding of the ES market. Similar ES products were offered by different ES vendors, which complicated the ES selection. Although Battery-Shell had no mature selection criteria at that time, this was gradually developed as more and more vendors visited. It began to learn about both the local ES market and its own system needs. The vendor visits were a key educational process.

An in-house developed 'production co-ordination table'was the core criteria for the ES selection but no ES vendor was willing to fulfill this requirement due to the complexity of the customisation needed. Thus, the V-GM had to compromise the selection decision on selected areas, such as: order management and stock management.

GZsoft emerged and presented a pre-designed 'basic module pack' to the company, with extensions promised once Battery-Shell had reached a more advanced level of implementation. Although other ES vendors provided similar ES solutions, the V-GM trusted GZsoft due to its involvement in welfare-oriented projects and GZsoft was selected. A budget of CNY100k was fixed.

5.2.2   ES implementation process

December 2008 to January 2009: After the contract signing, GZsoft gained a better control of the project, and the code rule needed to be determined for the basic information (e.g. customer information, Bill of Material). GZsoft introduced code rule templates but these did not fit Battery-Shell very well; for example, the maximum length of data fields had to be amended. Customisation was eventually made.

This is followed by trainings that was divided into three parts: general training, training on information coding, and departmental training. All personnel received training courses and undertook practical exercises as requested by GZsoft. The V-GM had to maintain hierarchical pressure to obtain a good level of commitment of employees. In January 2009, the vendor finished the training of information coding, and specific personnel from each department, chosen by Battery-Shell, learned how to conduct information coding.

January 2009 to 20th April 2009: GZsoft started to train individual departments in particular modules following the order processing cycle: from sales & marketing, to

procurement, production, stock, and back to sales & marketing. In March 2009, GZsoft finished the training and the implementation of the selected six order cycle modules began.

Battery-Shell many benefits including clear roles and responsibilities, more accurate stock and order management.
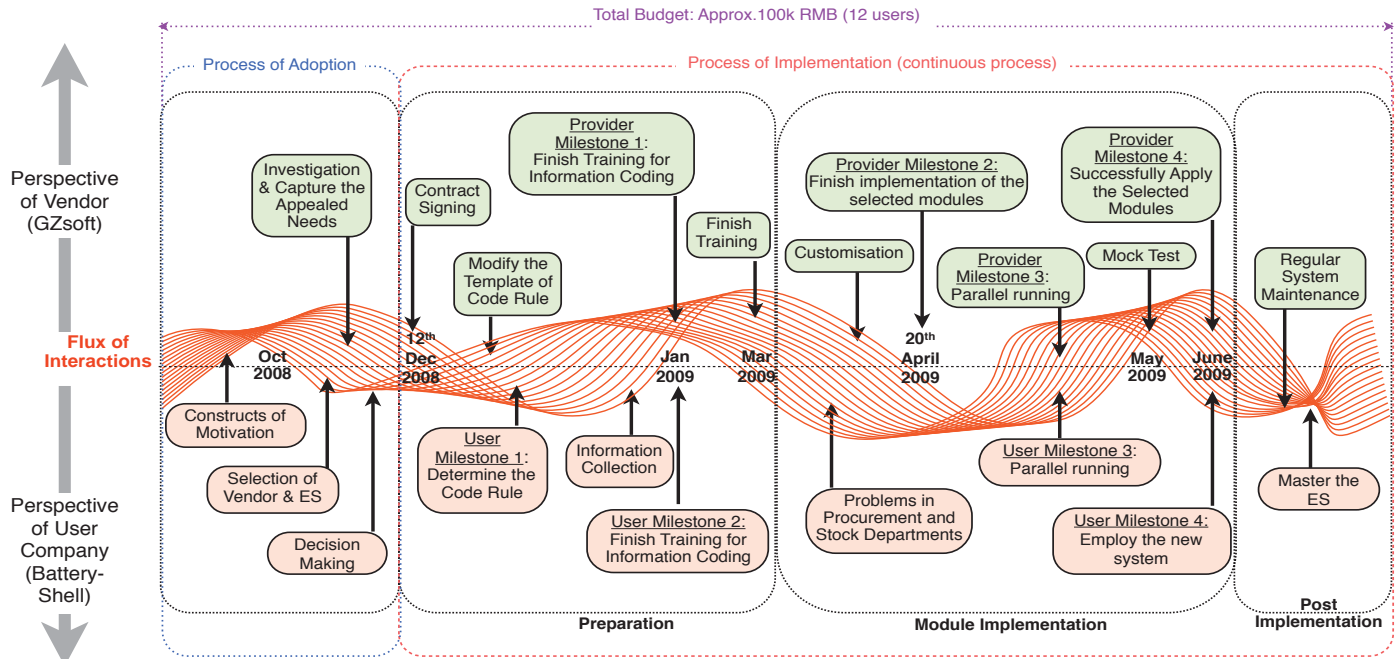
5.3 Governmental and Non-governmental Influence

Figure 2: Overall Process Schema

Implementation issues soon emerged during this process. For instance, Battery-Shell managed the aluminum by maintaining a safety stock instead of producing procurement plans, however generating a procurement plan was compulsory when using the ES. The vendor therefore had to re-design the procurement management module to meet the company's requirements. By the 20th of April 2009, module implementations were complete, and Battery-Shell started to use the new system. Most issues had been resolved, and employees became more familiar with the system. At this point both the electronic and manual systems were running in parallel.

20th April 2009 to May 2009: ES accuracy was developed through parallel running and by the end of May most of the order cycle had been transferred.

May 2009 to June 2009: The parallel running was followed by a major mock test of outcomes to further improve accuracy and improve collaboration between departments. GZsoft was still providing much assistance to ensure the accuracy of documents. GZsoft made further adjustments to parameters based on the outcomes of the mock test. In May 2009, the mock test was complete and Battery-Shell completed the transition to ES in June 2009.

Post June 2009: No further modules or customizations were added due to financial difficulties of Battery-Shell. GZsoft therefore limited post implementation service to distance support. Implementation of the basic modules brought

The process of adoption and implementation described above took place within the wider context of Government policy. Table 2 uses the six institutional actions from King et al. [17] to examine the influence of these governmental policies on the ES initiative taken by Battery-Shell. It summarises key policies aimed at incentivising companies to adopt information systems, how these policies have been interpreted at the local governmental level, and the influence, if any, that these policies have had at the company level, at least in the case of Battery-Shell.

The concept of institutional isomorphism proposed by DiMaggio & Powell [11] can be utilised to complement the King et al. [17] institutional model to focus on non-governmental influences. With poor influence of coercive power, mimetic power was shown to be a critical influence in the case of Battery-Shell, especially during the process of ES adoption. For instance, The V-GM considers his former company as the exemplar of success considering the scale of the business, which consequently motivates the ES adoption in Battery-Shell. Normative isomorphism is another critical power influences the experience of ES engagement in Battery-Shell, and this can be illustrated since similar ES products are offered from different vendors on the market.

Table 2. Governmental Influence and Intervention

Institutional Actions	Central Governmental Policies	Local Governmental Policies	Direct applicability to Battery-Shell
Knowledge Building	The construction of industrial parks is urged by law to encourage hi-tech research [25].	'Blue tunnel project' was initiated to establish an administrative service platform to provide ICT training [30].	No evidence for substantial influences
Knowledge Deployment	Government at all levels must integrate ICT knowledge into student curriculum [26].		No evidence for substantial influences
Subsidy	Government at different levels must provide funding support for ICT dissemination [26].	The approved SMEs can receive funds to carry out ICT-related projects [32].	Receive funding from Local government as the qualified hi-tech enterprises, which also motivates the pursuit of legitimacy.
Standard Setting	Torch program set clear requirements for obtaining national hi-tech company certificate(e.g. annual investment in R&D is greater than 5% of annual turnover, etc) [24].	Employ 'Blue tunnel project' to intensify the application of information systems, and enhance ICT competence in SMEs. It intended to register 20% of SMEs in the project by 2006, 50% by 2007 and 100% by 2008 [30].	Qualified as a hi-tech enterprise of ShenZhen city. However, no requirements relating to ES usage are specified in the policy.
Innovation Directive	Torch program have specific requirements to construct hi-tech industrial parks to boost ICT development [24]	Local tax bureau has particular pieces authorized taxation software for the company to use to governance on tax reports, validation of tax receipts, etc.	No evidence for substantial influences
Mobilization	The 863 program release particular national project contracts for public bidding to encouraged ICT adoption and innovation [23].	'Peacock scheme' released to attract overseas high-tech persons. The city council invests 300-500 million RMB to support innovation and entrepreneurship [31]	The encouraging ES environment offered legitimate explanations for ES innovation in the company.

6   Discussion and Conclusions

Much of the available ES literature is set in the context of large Western organizations, with an emphasis on the user perspective. The survey method is dominant, with a focus on what motivates a firm to implement ES and on the factors that are critical to implementation success. In contrast, this paper has examined in depth the implementation of ES in one selected Chinese SMEs using the case study method, but utilising the findings from the other three cases. It does this in the context of the ES provider and the Chinese and provincial government ICT policy. We are unaware of any other equivalent study. There are six research insights that have implications for the adoption of IT related innovations in a developing country context:

1) The western focus on a user perspective is problematic in the context of Chinese SMEs. The institutional setting is different which impacts on incentivisation and the decision to adopt. This suggests that user focused theories such as Technology Adoption Models (TAM) [10], and derivatives [35] are not comprehensive enough. The institutional context needs to be taken into account and this extends beyond policy to regulation and sector norms.

2) The role of the ES vendor in both the adoption decision and implementation for SMEs is particularly important and generally ignored. Unlike large companies with informed ICT resources SMEs are vulnerable and even choosing a provider is difficult. The lack of expertise puts SMEs in a weak position in the initial selection and contract stages. This is manifested in the scope of the pre-designed ES package offered by the ES vendors. They limit customisation and control the terms of the debate with the SME. This accords with work on Western SMEs [6][19]. The theoretical implication is that the power dynamic between user and provider needs to be addressed in models of SME engagement in ES.

3) ES is a complex application and the implementation is confirmed in this case to be an interactive process, often unpredictable, between the user and the provider. For the user the process of adoption and implementation is a learning journey. As the user company gains more understanding about ES, it may become more aware of its organisational concerns and requirements. Unexpected changes and modifications can be identified during the process of implementation. What the user sets out to achieve, and what is ultimately implemented, may be significantly different. The evidence in this case is strong that the final ES is emergent. This is further confirmation of the advantage of taking a process view rather than the common 'pre-post' event perspective.

4) Chinese government generally has shown its intention to drive ICT innovation through supply-push [17] policies. In China most issued policies are influential, rather than regulatory. This can be evident in the polices in regard of construction of Hi-Tech industrial park, demand of education reform, provision of ICT trainings, provision of funding supports, open the bidding for national ICT projects, etc.

The supply-push forces generated from the policies indicate the strong will of Chinese government to stimulate the ICT innovation, including initiatives such as ES, by all means. However, policy intent and implementation are different things. The interventionist role played by the government is modest, as seen from Table 2. The evidence from Battery-Shell suggests that while governmental influence is reasonably effective at the pre-implementation stage – to motivate and stimulate decision making – it is inadequate to sustain the process of implementation. Insufficient regulatory power may disable the issued polices to set clear objectives and guidance as measurements, which introduces uncertainties and ambiguities into the empirical operations.

5) In this research the policy implementation at local level is conditional. Although the hierarchical structure enables the

Chinese government to maintain a higher degree of unity, modified polices can still be implemented by the local government, and the user and provider companies may furthermore introduce their own agendas. Thus, a very clear finding to emerge from this study is that effective policy implementation requires better coordination and negotiation among central government, local government, and user and provider companies. A mechanism of policy evaluation is necessary to collect feedbacks from lower hierarchical levels to support policy design, and a better supervision of policy implementation is also required.

6) DiMaggio & Powell [11] institutional isomorphism is generated from the power of uncertainty. For the cases in this specific research the mimetic power is predominantly derived from market competition. SMEs are very aware and heavily influenced by what others are doing. The normative isomorphism is primarily from professionalisation. The SMEs, without internal expertise, are hugely influenced by the ES providers. Arguably the relatively weak influence of Chinese policy aimed at introducing technology innovations and good practice to SMEs means that SMEs lack guidance. Without this SMEs become more uncertain of how to incorporate and benefit from the new technologies. In this way the institutional isomorphic effect is shown in this research to be very important. Much more so in fact than the classic CSFs such as senior management support or educational levels.

We recognise the limitations in this paper. It has focused on one case and on the right-hand side of the theoretical framework, based on King et al.'s [17] institutional actions. However, the indications from the other three cases are largely consistent with Case A: Battery-Shell. The implications for theory relating to SMEs in a developing country context are profound. It suggests that an ES 'user-provider' model, in an institutional setting, is likely to provide a more relevant and robust approach to the issues involved in bringing ES – a complex technology – to successful implementation.

7   References

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