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UNDERSTANDING THE UTILISATION OF INFORMATION SYSTEMS EVALUATION: FOUR CASE STUDIES

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Abstract

The aim of this study is to explore and investigate the use of Information System (IS) evaluation in practice. Given that evaluation use is not a well-studied topic in IS research, we first propose a theoretical framework based on literature review, to guide our understanding of relevant issues. This framework identifies three important dimensions in related to IS evaluation: IS evaluation, Stakeholder involvement and Evaluation use. These dimensions are examined in four IS projects in China. In total, 37 interviews have been conducted and data are analysed using Leximancer qualitative data analysis software. Results are organised based on the proposed framework. The results suggest that both the evaluation process and the output from IS evaluation can be used instrumentally, conceptually and symbolically by different stakeholders. A list of such uses are generated in each case, with concepts identified by Leximancer. The cases demonstrate the applicability of the proposed framework and areas for further development are identified.

Keywords: Information System, Evaluation, Use of Evaluation, Stakeholder Involvement, Leximancer.
1. INTRODUCTION

Evaluation is widely considered as being a critical component in the success of Information Systems (IS) (Farbey et al. 1999b; Guimaraes et al. 2009; Irani & Love 2001; Serafeimidis 1996; Song & Letch 2012). It can play various roles and serve many purposes in an IS project. For instance, Farbey et al. (1999a, p. 218) contend “… evaluation [is] not simply undertaken for the purpose of deciding whether or not to initiate or continue a project. … [it] may be summative, emphasising performance and attainment of objects, or formative, that is designed to illuminate and learn”. However, “[IS] evaluation has no intrinsic value in itself; its value is determined by its use” (van der Zee 2002, p. 275). As such, evaluation is only worth doing when it is effectively used to serve its purpose. Nevertheless, how it is actually used, is often overlooked in both research and practice. Although the use of evaluation is arguably the most researched area in the wider domain of evaluation studies (Johnson et al. 2009), when it comes to the IS field, few, if any, efforts have investigated how IS evaluation is actually used. In practice, IS evaluation is often undertaken in an ad hoc manner or for ritualistic reasons (Nijland & Willcocks 2008). Therefore in this paper we aim to address this mismatch between the theoretical importance of evaluation and what occurs in practice.

Given a lack of frameworks in the IS domain for understanding IS evaluation use we refer to other disciplines where the use of evaluation is well-documented. We propose a framework for guiding our understanding of IS evaluation use, integrating three important dimensions: IS evaluation, stakeholder involvement and the use of evaluation. Since this framework is developed based on research in other disciplines, simply adapting such findings into IS context might result many problems. This is because the context sensitivity of evaluation has been well recognised in both IS domains (Stockdale et al. 2008; Symons 1991) and evaluation studies (Greene 1987; 1988a; Shulha 1997).

In this case, we carried out an empirical study is to explore the use of IS evaluation in practice. Four IS projects in different organisations in China were studied and we apply the proposed framework to guide our understanding of the current IS evaluation practice in each case. More importantly, we expect the evidence from the case studies can help us examine and further refine the framework by: first, conducting within case studies to add our understandings on each dimension of the framework; and second, conducting cross-case analysis to examine the proposed relationships. In this paper, however, we only demonstrate the first development, which is a descriptive analysis of current practice of IS evaluation, stakeholder involvement and its use from the four case studies separately.

2. THE THEORETICAL FRAMEWORK

Figure 1 shows the theoretical framework we proposed for understanding IS evaluation use. It consists of three major dimensions: IS evaluation, the utilisation of evaluation and stakeholder involvement. A frequently cited definition of IS evaluation provided by Farbey et al. (1999a) is : “A process, or group of parallel processes, which take place at different points in time or continuously, for searching and for making explicit, quantitatively or qualitatively, all the impacts of an IT project and the programme and strategy of which it is a part” (p. 207). However, IS evaluation is a multifaceted and complicated phenomenon which can be examined from multiple perspectives. In order to better understand how evaluation take place in an IS project, we adapt a recognised and well-structured framework (Serafeimidis 2002; Stockdale & Standing 2006; Stockdale et al. 2008), namely, the Content, Context and Process (CCP) model.

The CCP model breaks evaluation into five elements: “why”, “who”, “what”, “when” and “how”. In doing so, it recognises a wide range of interrelated factors that need to be taken into account in an effective evaluation (Serafeimidis 2002; Stockdale & Standing 2006). Extensive discussion on the CCP model can be found in Symons (1991), Irani and Love (2001) and Stockdale and Standing (2006). In this paper we focus on linking the “why” and “who” elements in the “context”.

In each specific context, the evaluation of IS is motivated by the different needs of the project or organisation, for instance, ranking alternatives (Guimaraes 1989), providing feedback (Baker 1995) and facilitating organisational learning (Smithson & Hirschheim 1998). In other words, there should
be a reason (“why”) IS evaluation is performed. Only through such use can evaluation impact on the IS or the organisation in which the IS is implemented and be considered worthwhile (Patton 1997). However, one criticism to the CCP model is that it does not reflect the outcomes that emerge in performing evaluation (Serafeimidis 1996). To counter this, some researchers include the outputs of evaluation in the original CCP model, and further define evaluation outcomes to be the impacts of evaluation and its outputs (Serafeimidis 1996). Our study focuses on how evaluation is used in organisations (utilisation of evaluation).

**Figure 1. The proposed framework: understanding the use of IS evaluation**

Based on evaluation use research in several other disciplines, use of evaluation can be viewed in terms of the outputs of evaluation (Briedenhann & Butts 2005; Weiss 1998), as well as the processes of evaluation (Alkin & Taut 2003; Greene 1988b). For the former, in a study of the use of social program evaluation, Weiss (1998) contends that “if the evaluator developed recommendations based on the findings, then the recommendations were supposed to be used” (p. 24). For the latter, Patton (1997) defines process use as “individual changes in thinking and behaviour and program or organizational changes in procedures and culture that occur among those involved in evaluation as a result of the learning that occurs during the evaluation process” (p. 90). From this definition, learning becomes the premier concern of the use of evaluation process with some even contending that learning is the central purpose of all evaluation (Rebien 1996).

Three types of use are widely agreed by evaluation use researchers, namely: instrumental use, conceptual use and symbolic use. Instrumental use is defined as “… the specific way in which [evaluation] was being used for decision-making or problem solving purpose” (Leviton & Hughes 1981, p. 528). Conceptual use of evaluation information is defined as “influencing a policy maker’s thinking about an issue without putting information to any specific, documentable use” (Leviton & Hughes 1981, p. 528). Symbolic use refers to the political use of evaluation both within and beyond a project (Greene 1988a; Weiss 1998).

The “who” element of the CCP model concerns another important dimension in regard to the use of evaluation: stakeholder involvement. The increased involvement of different stakeholders is posited as an effective way to improve evaluation and its utilisation in many other disciplines (Briedenhann & Butts 2005; Butterfoss 2001; Greene 1988a). Although the CCP model suggests an interaction between elements in each dimension of IS evaluation, it also stresses that people are at the centre of any IS evaluation (Serafeimidis & Smithson 1999; Stockdale et al. 2008). As Taut (2008) suggests, depending on the breadth of stakeholders involved in an evaluation and the degree to which they are immersed in it (depth) there will be different consequences and effects, in terms of both how the evaluation is conducted (Stockdale & Standing 2006) and outputs (Patton 1997). Although we focus on the role of human stakeholders, other contextual factors are also important to the use of evaluation (Alkin & Taut 2003). Therefore, in our case studies, we describe the background of each case to place the IS evaluations within their specific contexts.
In applying this framework to guide our analysis, the process of an IS evaluation and its outputs can be used instrumentally, conceptually and/or symbolically. A variety of stakeholders (breadth) may be involved in this evaluation to different degrees (depth) and they will impact the evaluation process and the quality of evaluation outputs, and subsequently their use.

3. RESEARCH METHODOLOGY

We chose the multiple case study method as our approach (Eisenhardt 1989; Yin 2002). This method allows the researcher to learn about, and to try to understand, a contemporary phenomenon in its real world context and provides a way of collecting, organising, and analysing data to obtain comprehensive, systematic, and in-depth information about the case (Thiesse et al. 2009), therefore it is suitable for this study. In particular, case studies are especially useful for early, exploratory investigations in which the phenomenon is not yet completely understood and for which existing theory seems insufficient (Benbasat et al. 1987).

3.1 Data collection

The key criterion for case selection was that organisations were either about to finish an IS project or had recently completed one within the past 2 years. These choices were made for two reasons. Firstly, regardless of its soundness, the selected IS projects would have completed a full development life cycle including some form of evaluation at various stages. Secondly, the experiences and impressions of the project would still be fresh in the minds of interview participants. The four IS projects investigated were a Hospital Information System, a portal website, an ERP integration platform, and a security system. Each of these projects was conducted in China from March to October 2012.

After gaining permission to conduct case study on each site, all related documentation, including case documents, publications, reports and meeting minutes were made available to the principle investigator. All documents were carefully reviewed to establish general organisational information; establish general IS project information; identify the forms of evaluation that had taken place in the project; and identify stakeholders groups involved in the project and evaluation. From this, stakeholders representing different groups involved in each project were recruited to participate in interviews to relate their personal experiences and understanding of the project being investigated.

In total, 37 stakeholders were interviewed across the four cases. In QJHIS, 10 interviews (coded as QJHIS001 to QJHIS010) were conducted, including 2 project managers, 1 system analyst, 2 project members and 5 users. In JSNews, 9 interviews (coded as JSNews001 to JSNews009) were conducted, including 2 project managers, 2 project members, 1 third part expert and 4 users. In CNPower, 10 interviews (coded as CNPower001 to CNPower010) were conducted, including 2 top managers, 2 project managers, 2 consultants, 1 system analyst, 1 third party expert and 2 users. In CMSecu, 8 interviews (coded as CMSecu001 to CMSecu008) were conducted, including 2 project managers, 1 system analyst, 1 system tester and other 4 project members.

Rather than having structured or open-ended interviews, semi-structured interviews were be used for this research project. According to Burns (1997), semi-structured interviews are appropriate for descriptive research. It allowed a rich exploration of evaluation processes while remaining open to emergent issues. The duration of each interview was approximately 30 min and conducted on a one-to-one basis. Most interviews were carried out face-to-face, but a couple of them were conducted using online chatting software due to the availability of the interviewees. All interviews were recorded, transcribed and the transcripts were validated with interviewees.

3.2 Data Analysis – Using Leximancer

Analysing each case consisted of the following procedures. A general background of each case organisation and IS project is described. The analysis then details of the evaluation process and outputs, stakeholders’ involved and possible use of evaluation are outlined, based on three dimensions in our framework. Our analysis of interview data was supported by using the text analysis software “Leximancer” which is an Australian-developed data-mining tool that uses algorithms, machine
learning and statistical processes to automatically identify and map the main concepts in the text, and how they relate to each other (for a detailed description, see Rooney 2005; Smith & Humphreys 2006). To do this, Leximancer uses word frequency to identify the major or most important concepts from the text, which serves as the primary sources of information for our analysis. These concepts provide insight into the content of interviewees’ responses and identify major concepts regarding IS evaluation use. Leximancer is considered to be a useful tool in this particular paper for mainly two reasons. Firstly, Leximancer analysis is proven to be of great reliability, as assessed in stability and reproducibility (Smith & Humphreys 2006). Secondly, Leximancer abstracts covered concepts within a body of text whilst reducing expectation biases which may arise in manual coding (Kivunja 2013).

During pre-setting of Leximancer, necessary edits were made to the transcripts. For instance, interview questions are removed from analysis because only interviewee responses are valuable for our study. After the necessary edits to the transcripts, we used Leximancer to analyse the data from four cases separately. Nevertheless, because Leximancer only picks up high frequency words and the topic of IS evaluation use was not well understood by our interviewees, relying only on machine learning alone might result in overlooking some important concepts. Therefore, we also manually analysed the original interview record to provide a holistic picture of the case. In order to differentiate the two, we will use square brackets ([]) for Leximancer concepts and quotation marks (“”) for original texts throughout our analysis. Results and findings are elaborated in details in the following section.

4. CASE ANALYSES

4.1 QJHIS

**Context** - QJ Centre Hospital (hereafter the Hospital) is the largest local hospital in a city in central China. In early 2010, the Hospital found its Hospital Information System (HIS) in use was too “old” to support its increasing patient numbers and fulfilling their service requirements. Meanwhile, departments which previously had no system raised their demand for “informationisation”. In this case, the managers decided to replace its old HIS with a more effective and enterprise wide system, the QJHIS.

By the end of January, 2011, the Hospital selected a vendor from a formal bidding process and initiated the project. The system was customised, configured and deployed in the hospital department by department. This approach was taken mainly due to two reasons. Firstly the hospital was too large to adopt a “big bang” implementation which would require significant and extensive resources to be simultaneously allocated to the project. Secondly, a new hospital building was under construction at the time of implementation and many departments were moving into the new building.

**Evaluation Process** – Prior to the system implementation, experts from other hospitals and institutes were invited to evaluate the proposed system solutions offered by vendors and help the Hospital selecting the appropriate one. Experts were required to score each vendor according to a range of criteria, such as system quality, medication review solution, user training strategy and after-sale services. However, no formal financial appraisal of the system was performed. The major concern that the Hospital had was the “price” of the system.

During the project, evaluation was performed in an informal manner in three training sessions and the focus was on the system customisation. In the first training, key staff from each department were invited to learn and use the vanilla version of the system and to provide feedback on customisation requirements. Such requirements were then collected, reviewed and confirmed by the project team, but only “rational” and “feasible” customisations were approved and completed. In the second training, the key staff were invited again to examine whether the system has been customised according to their needs. The third training took place when the system was installed in each department. At this stage, all staff were required to participate in this training to learn how to use the system. This also served as a test of the system functionality and stability before the system was pushed online.
The ex-post review was performed after the QJHIS had been in operation for a few weeks. Managers in each department were asked to evaluate their own module of the system and sign an "Acceptance Report" separately. No formal evaluation method was used in this. Judgements were made primarily based on "... the performance of the system in work" and managers’ "... satisfaction with the system and vendor's service" (QJHIS007). It is important to notice that only when all managers signed the report, that the vendor could receive the final payment for the project.

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Support decision making</td>
<td>• Support decision making</td>
</tr>
<tr>
<td>- IT department relays on expert scoring table for vendor selection;</td>
<td>- IT department becomes aware of how evaluation is performed and</td>
</tr>
<tr>
<td>- [Acceptance] of the [system] in each [department] is decided</td>
<td>more confident in the vendor selection;</td>
</tr>
<tr>
<td>by [managers] based on [evaluation];</td>
<td>• Support system development</td>
</tr>
<tr>
<td>• Support system development</td>
<td>- [Customisation] [requirements] are obtained by users [participated]</td>
</tr>
<tr>
<td>- Feasible [customisation] [requirements] are formally</td>
<td>in [training];</td>
</tr>
<tr>
<td>documented for the [project];</td>
<td>• Improve system quality</td>
</tr>
<tr>
<td>• Improve system quality</td>
<td>- on-going evaluation was used as a feedback mechanism on</td>
</tr>
<tr>
<td>- [feedbacks] from [users] [test] are [used] to diagnose and fix</td>
<td>customisation and system quality</td>
</tr>
<tr>
<td>[system] [problems]</td>
<td>- The last [training] also serves as a [test] of system functionality</td>
</tr>
<tr>
<td>• Instrumental Use</td>
<td></td>
</tr>
<tr>
<td>- Support decision making</td>
<td>• Stakeholder empowerment</td>
</tr>
<tr>
<td>- IT department relays on expert scoring table for vendor selection;</td>
<td>- Regardless result, involving users in the training is considered to</td>
</tr>
<tr>
<td>- [Acceptance] of the [system] in each [department] is decided</td>
<td>give voice to different perspectives;</td>
</tr>
<tr>
<td>by [managers] based on [evaluation];</td>
<td>• Strategy Bargain</td>
</tr>
<tr>
<td>• Conceptual Use</td>
<td></td>
</tr>
<tr>
<td>- Learn about system</td>
<td>- Vendor can only receive the final payment till all modules are</td>
</tr>
<tr>
<td>- Project [team] learn about customer needs from documented</td>
<td>accepted; therefore, the ex-post evaluation is used as a bargain</td>
</tr>
<tr>
<td>[requirements];</td>
<td>strategy by the hospital;</td>
</tr>
<tr>
<td>- Users learn about [project] progress from documented</td>
<td>• Symbolic use</td>
</tr>
<tr>
<td>[feedbacks];</td>
<td>- Accumulation of &quot;best practice&quot;</td>
</tr>
<tr>
<td>• Symbolic use</td>
<td>- Good [customisation] are kept in the system and can be used in</td>
</tr>
<tr>
<td>- Change perceptions</td>
<td>other projects;</td>
</tr>
<tr>
<td>- Changed perceptions are informally communicated between</td>
<td>- Successful [project] can be a good illustration for other clients;</td>
</tr>
<tr>
<td>users, resulting in resistance among a group of people</td>
<td>• Stakeholder empowerment</td>
</tr>
<tr>
<td>• Stakeholder Involvement</td>
<td>- Regardless result, involving users in the training is considered to</td>
</tr>
<tr>
<td>– In ex-ante evaluation, external experts were the major evaluator</td>
<td>give voice to different perspectives;</td>
</tr>
<tr>
<td>for proposed systems.</td>
<td>• Strategy Bargain</td>
</tr>
<tr>
<td>- The IT department participated in the selection process and made</td>
<td>- Vendor can only receive the final payment till all modules are</td>
</tr>
<tr>
<td>the final decisions based on experts’ advice.</td>
<td>accepted; therefore, the ex-post evaluation is used as a bargain</td>
</tr>
<tr>
<td>- In ex-post evaluation, managers in each department were involved</td>
<td>strategy by the hospital;</td>
</tr>
<tr>
<td>and they were responsible for the acceptance or rejection of a</td>
<td>• Symbolic use</td>
</tr>
<tr>
<td>specific module of the system.</td>
<td>- Accumulation of &quot;best practice&quot;</td>
</tr>
<tr>
<td>- During the on-going evaluation, all users were required to</td>
<td>- Good [customisation] are kept in the system and can be used in</td>
</tr>
<tr>
<td>participate in the training at least once.</td>
<td>other projects;</td>
</tr>
<tr>
<td>- Due to the length of training sessions, their contact with the</td>
<td>- Successful [project] can be a good illustration for other clients;</td>
</tr>
<tr>
<td>project team was relatively limited.</td>
<td>• Stakeholder empowerment</td>
</tr>
<tr>
<td>• Evaluation Use – We used Leximancer concepts and a manual</td>
<td>- Regardless result, involving users in the training is considered to</td>
</tr>
<tr>
<td>interrogation of transcripts to identify all possible uses in the</td>
<td>give voice to different perspectives;</td>
</tr>
<tr>
<td>case. A summary of its use in QJHIS project see Table 1.</td>
<td>• Strategy Bargain</td>
</tr>
<tr>
<td>4.2 JSNews</td>
<td>- Vendor can only receive the final payment till all modules are</td>
</tr>
<tr>
<td>Context – JSNews.com (hereafter JSNews) is a large provincial</td>
<td>accepted; therefore, the ex-post evaluation is used as a bargain</td>
</tr>
<tr>
<td>comprehensive web portal in an east coast province in China. It</td>
<td>strategy by the hospital;</td>
</tr>
<tr>
<td>was officially launched in late 2001, and co-organised by the</td>
<td>• Symbolic use</td>
</tr>
</tbody>
</table>
|     provincial
committee of the Communist Party of China and the provincial government. In early 2010, in accordance with the development strategy and general goals of the province, the government decided to restructure JSNews from a state-owned organisation to a private company. A new company, JSNews Media Co., Ltd, was established to operate and manage the website. Meanwhile, to pursue its new image and strategy, JSNews carried out a system upgrade project to replace its old system.

The project was unfolded in two phases. In the first phase, JSNews focussed on selecting and purchasing hardware and software. In the second phase, JSNews invited an IT company to install the software and configure the system, and the new website was officially online in later 2010. The actual integration project was considered “very simple”. However, because of its importance and government background, the project was carried out in a very formal manner.

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Instrumental Use</strong></td>
<td><strong>Support decision making</strong></td>
</tr>
<tr>
<td>• Summarise evaluation - [Evaluation] documents “formally sum up some important things raised from informal communication”</td>
<td>• Scheduled [reviews] during the [system] integration help IT [department] to adjust [project] [design] and resources allocations</td>
</tr>
<tr>
<td>• Support decision making - IT [department] specify [system] [requirements] [based] on findings from visiting other websites; - IT [department] selected [hardware], software and integration solution providers [based] on [expert] [review];</td>
<td>• Improve system quality - [System] is continuously debugged at the [test] [stages];</td>
</tr>
<tr>
<td>• Improve system quality - [Problems] are fixed and [system] is improved from responding to user feedbacks in the [test];</td>
<td>• Control Cost - Saving spaces can be identified in [evaluation];</td>
</tr>
<tr>
<td><strong>Conceptual Use</strong></td>
<td><strong>Learn about project</strong></td>
</tr>
<tr>
<td>• Learn about project - Third party [experts] learn about [system] [test] from reviewing [test] report;</td>
<td>• IT [department] learns about current IS practise in other organisations; project feasibility, vendor performances; [system] [quality];</td>
</tr>
<tr>
<td>• Influences on morale - Passing [evaluation] makes team member a “strong sense of achievement”</td>
<td>• Vendor learns about user [requirements];</td>
</tr>
<tr>
<td>• Learn about evaluation - IT [department] can learn how to perform [evaluation] from [experts];</td>
<td>• Learn about evaluation - IT [department] learns about current IS practise in other organisations; project feasibility, vendor performances; [system] [quality];</td>
</tr>
<tr>
<td><strong>Symbolic use</strong></td>
<td><strong>Establish personal network</strong></td>
</tr>
<tr>
<td>• Accountability - Acceptance [review] forms can be used as evidences when [system] (including [hardware] and software) is not delivered as required</td>
<td>• Stakeholders [involved] establish personal networks during [evaluation];</td>
</tr>
<tr>
<td>• Project delivery process - Scheduled [reviews] and [test] are performed as required by [project] plan</td>
<td>• Stakeholder dis-empowerment - Major stakeholders can be excluded from [evaluation] by [people] with more power;</td>
</tr>
<tr>
<td>• Acceptance [review] is a closure sign for the [project];</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2. Use of IS Evaluation in JSNews**

**Evaluation Process** – In the first phase, a number of activities were performed to select appropriate hardware and software for the new website. Firstly, the IT department arranged a few visits to other portal website companies to find out “what they were doing, what technology they were using, and how they conducted the project” (JSNews001). Secondly, they invited some experts from local universities and IT consulting companies to help them specifying system requirements. Thirdly, they conducted a market research, and called for bids in the public with the help of experts. Lastly, when the hardware was delivered, IT department conducted an acceptance review, focusing on “the look of exterior, the completeness of accessories, [and] main technical features” (JSNews002).

In the second phase, the expert panel helped the IT department in reviewing the vendor’s project proposal. Then the system integration and deployment was carried out as scheduled. However, no formal evaluation was identified by interviewees during the process. When system was ready to go live, an internal test was conducted to assess the system functionality and usability. Shortly after the website went online, a small scale user test was organised and a pressure test was conducted to examine its performance under a high volume of visits. After the system passed those tests, IT department conducted the final acceptance review and officially closed the project.

**Evaluation Outputs** – The evaluation at JSNews project was a rather formal approach, but not all evaluation outputs were formally documented, in particular for the ex-ante evaluations. For instance, in the first phase, the findings of their visits to other major websites were not reported. Meanwhile, expert suggestions on the system requirements were only reflected on the tender invitations. On the
other hand, JSNews tended to play more attention to the ex-post evaluation. The system test was properly designed and well documented in test design plan, bug tickets and test report. User feedback was collected by questionnaires at the end of user test session. Moreover, the IT manager developed formal acceptance review forms for the hardware acceptance and system acceptance.

**Stakeholder Involvement** – In this project, IT department and expert panel were the major evaluators. User departments helped the IT department in specifying their requirements on the system, but they were not involved in the actual project. In the second phase, the system implementation was mainly driven by the vendor company. Users were not involved until the system test stage. However, considering the population of its public users, the sample size in the user test was very small. It is also interesting to notice that even the IT manager was in charge of the project and he developed the acceptance review forms, he was excluded from the final acceptance review by his “leader”.

**Evaluation Use** – results regarding IS evaluation use in the JSNews case are summarised in Table 2.

### 4.3 CNPower

**Context** – The Power Investment Co. LTD (hereafter Power) is a subsidiary of one of the top five energy companies in China. Over the last decade, it had developed and purchased a number of systems from different vendors to support its business and management in various sections of the organisation. However, as no standard was specified when Power was installing those systems, data in each system could not be exchanged. These “information islands” became the barrier for the synchronisation of its business, and subsequently became an obstacle to Powers’ strategic development.

To overcome this problem, the managers of Power decide to develop a platform that integrates all separated systems together. After a market investigation, it invited a few IS Companies to compete for the project and finally selected UniSys as its provider. The integration project, CNPower, was carried out following a standard IS project life cycle (Capability Maturity Model Integration, CMMI, Level 5). This process included initial investigating, system analysis, system design, system development, implementation and operation and maintenance. It was started in January 2011 and was fully delivered in June 2012 and the system went online in the entire organisation at the same time.

**Evaluation Process** – Before the project was initialised, the ex-ante evaluation focussed on vendor selection. A number of formal review meetings were organised to assess each vendor on their experience, qualification, organisation size, project design and price. However, one important factor assisting UniSys in winning the project was their “long-term, strategic cooperation relationship” (CNPower002, CNPower007 and CNPower009) with the Power’s mother company.

During the system implementation, the project was performed following CMMI L5 standard. A review was conducted for each stage of the project life cycle. Also, informal evaluation of the project was performed implicitly by the project teams, and formal meetings were held when necessary. Moreover, the system test was well designed, documented and reported. Meanwhile, a user survey using an online questionnaire was conducted at the test stage. Two months after the system was officially online, a post-implementation review was carried out and the project was officially signed off.

**Evaluation Outputs** – UniSys had specific requirements for evaluation in their projects, namely: complete, accurate, rational and reliable. In this case, besides ex-ante evaluation which took place before the vendor was involved, all formal evaluation and review meetings were well documented in this project. These documents included reports for each stage of the IS development, review meeting minutes, test design, bug tickets, test reports, user survey and the post-implementation review report.

**Stakeholder Involvement** – An expert panel and the IT department were involved in the vendor selection process. During the project, only some major players from the IT department and vendor project teams were involved in the evaluation. The senior management of both organisations and relevant managers in user department were also involved when there were major conflicts or difficulties in the project. UniSys also formed a consulting group to participate in the review meetings
to oversee the project and control its quality. Users were not directly involved until the test stage, and when they were involved, the whole organisation participated in the test and survey.

**Evaluation Use** – results regarding IS evaluation use in the CNPower case are summarised in Table 3.

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Formative evaluation</td>
<td>● Support decision making</td>
</tr>
<tr>
<td>- [Evaluation] is “directive” and it is a “a control of general direction” of the IS [implementation];</td>
<td>- Vendor makes decision on competing the [project] or not;</td>
</tr>
<tr>
<td>● Summative evaluation</td>
<td>- Owner makes decision on which vendor to select</td>
</tr>
<tr>
<td>- [Evaluation] is a “conclusive” remark of a [stage] or a [project];</td>
<td>● Improve system quality</td>
</tr>
<tr>
<td>● Support decision making</td>
<td>- “Evaluation controls the accuracy of the understanding of user requirements”;</td>
</tr>
<tr>
<td>- Experts and [client] select the vendor</td>
<td>- “Project governance quality” and “service quality” are ensured in continuous [evaluation];</td>
</tr>
<tr>
<td>- [Client] decides [project] plan based on [evaluation];</td>
<td>- [System] is continuously debugged at the [test] [stages];</td>
</tr>
<tr>
<td>- [Problems] identified helps [client] decide future [projects];</td>
<td>● Improve evaluation</td>
</tr>
<tr>
<td></td>
<td>- In early [stages] [evaluation], [project] [team] can specify content and standard for the [evaluation] in later [stages];</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Conceptual Use</th>
<th>Symbolic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Change perceptions</td>
<td>● Learn about project</td>
</tr>
<tr>
<td>- Participating in [evaluation] let IT [department] learn more details about the [project] and this increases their confidence; and subsequently:</td>
<td>- In ex-ante [evaluation], experts helps [client] to learn about IS performance, impacts and risks;</td>
</tr>
<tr>
<td>- It increases IT [department’s] satisfaction as well as acceptance of the [system];</td>
<td>- [People] [involved] can learn about: user [requirements], performances and outcomes; [system] [quality]; the IS usage; and end-user perceptions;</td>
</tr>
<tr>
<td>- [Knowledge] can be transferred from experienced experts to [team] members who are in their early career, between [business] and technology personnel, and vendor and [client];</td>
<td>● Achieve commitment</td>
</tr>
<tr>
<td>- Support knowledge management</td>
<td>- [Evaluation] provide a “platform” for [different] [people] to communicate; as a result:</td>
</tr>
<tr>
<td>- Third party [experts] learn about [project] progress and performances from [evaluation] documents;</td>
<td>- Mutual understanding is achieved between [team] members, vendor and IS owners, and [different] user [departments];</td>
</tr>
<tr>
<td>- [System] is continuously debugged at the [test] [stages];</td>
<td>● Improve system quality</td>
</tr>
<tr>
<td></td>
<td>- “Evaluation controls the accuracy of the understanding of user requirements”;</td>
</tr>
<tr>
<td></td>
<td>- “Project governance quality” and “service quality” are ensured in continuous [evaluation];</td>
</tr>
<tr>
<td></td>
<td>- [System] is continuously debugged at the [test] [stages];</td>
</tr>
<tr>
<td></td>
<td>● Improve evaluation</td>
</tr>
<tr>
<td></td>
<td>- In early [stages] [evaluation], [project] [team] can specify content and standard for the [evaluation] in later [stages];</td>
</tr>
<tr>
<td></td>
<td>● Achieve commitment</td>
</tr>
<tr>
<td></td>
<td>- [Knowledge] can be transferred from experienced experts to [team] members who are in their early career, between [business] and technology personnel, and vendor and [client];</td>
</tr>
<tr>
<td></td>
<td>● Support knowledge management</td>
</tr>
<tr>
<td></td>
<td>- [Evaluation] is “a resource of generating individual knowledge” on [project] [management], [system] [development] and [evaluation];</td>
</tr>
<tr>
<td></td>
<td>- [Knowledge] can be transferred from experienced experts to [team] members who are in their early career, between [business] and technology personnel, and vendor and [client];</td>
</tr>
<tr>
<td></td>
<td>● Improve system quality</td>
</tr>
<tr>
<td></td>
<td>- “Evaluation controls the accuracy of the understanding of user requirements”;</td>
</tr>
<tr>
<td></td>
<td>- “Project governance quality” and “service quality” are ensured in continuous [evaluation];</td>
</tr>
<tr>
<td></td>
<td>- [System] is continuously debugged at the [test] [stages];</td>
</tr>
<tr>
<td></td>
<td>● Improve evaluation</td>
</tr>
<tr>
<td></td>
<td>- In early [stages] [evaluation], [project] [team] can specify content and standard for the [evaluation] in later [stages];</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Instrumental Use</th>
<th>Symbolic use</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Accountability</td>
<td>● Symbol of good management</td>
</tr>
<tr>
<td>- Changes of [requirements] are well documented for possible argument after-sale;</td>
<td>- The existence of on-going [evaluation] represent a good [project] [management] manner of the vender;</td>
</tr>
<tr>
<td>- [Evaluation] documents are considered as records which allows [client] “to track problems”;</td>
<td>● Stakeholder empowerment</td>
</tr>
<tr>
<td>● Project delivery process</td>
<td>- Using survey, the [project] [team] invites [different] “voices”, “listen and respond to them”;</td>
</tr>
<tr>
<td>- Scheduled [reviews] are performed as required by [implementation] plan;</td>
<td>● Support knowledge management</td>
</tr>
<tr>
<td>- Only when [reviews] are passed, the project can be proceeded to the next [stage];</td>
<td>- [Evaluation] is “a resource of generating individual knowledge” on [project] [management], [system] [development] and [evaluation];</td>
</tr>
<tr>
<td>- Acceptance [review] is a closure sign for the [project];</td>
<td>- [Knowledge] can be transferred from experienced experts to [team] members who are in their early career, between [business] and technology personnel, and vendor and [client];</td>
</tr>
</tbody>
</table>

Table 3. Use of IS Evaluation in CNPower

4.4 CMSecu

**Context** – Centre Mobile Limited (hereafter Mobile) is a leading mobile services provider in China. In recent years, with the advancement of “smart devices”, Mobile was facing an increasing pressure in managing malware and viruses within mobile applications. In this case, Mobile decided to develop a system, CMSecu, which automatically collects, analyses, processes, manages and reports malware. In the middle of 2011, Mobile outsourced this project to a small IT security solution company. The project unfolded in two phases. In the first phase, the project team focussed on developing the basic functionality of the system to automatically collect samples from Mobile’s servers and databases, and perform pre-treatment on the suspicious samples. However, manual analysis and treatment was still required at this phase. In the second phase, the system was further developed to achieve full automation of malware collection, analysis and treatment on different operation systems, including Symbian, Android, iOS and WP7.

**Evaluation Process** – the project team had weekly meetings to review the progress of the week and make plans for the next progress. However, since this system is highly technology-oriented, the
The premier focus of the evaluation is on the technical details, functions and performance of the system. In the planning stage, the project team evaluate the difficulty of the project and identified a number of key functions. During the system implementation, the project team specified four milestones and the premier evaluation approach was the tests at different milestones. At the first milestone, the development team accomplished programming for key functions and internally delivered them to the implementation team. At the second milestone, different functions were integrated to the system and a “demo” system was developed and delivered to Mobile. At the third milestone, a test environment was built and the system was tested and improved continuously until it went live. At the last milestone, the system was officially accepted by Mobile after the system had been tested online for a while and all bugs and problems were fixed. Subsequently, tests took places at the each milestone, assessing if required functions can be achieved accurately.

**Evaluation Outputs** – The weekly meetings were well documented. It specified the tasks had been accomplished at each week and make plans on research and development, documentation and maintenance of the next. Besides, Mobile has very specific technical requirements and software testing standard. Therefore, all evaluation, or tests were well-designed and recorded. For the final acceptance review of the system, it was also technical-oriented, and the review report was basically a collection of test reports.

**Stakeholder Involvement** – In total only 8 people were directly involved in the entire project. The Mobile had formed a project team to follow up the case, including 1 project manager, 2 system analyst, 1 sample analyst and 1 software engineer. On the other hand, the vendor was a small company and the project team only consists of three people: 1 project manager, 1 system analyst and 1 software engineer. However, it had about 8 people development team responsible for the research and development of the system.

**Evaluation Use** – results regarding IS evaluation use in the CMSecu case are summarised in Table 4.

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>● Summative evaluation</td>
<td>● Improve system quality</td>
</tr>
<tr>
<td>- Weekly [reports] is a summary of current progress;</td>
<td>- [Evaluation] ensures a “technology-business fit”;</td>
</tr>
<tr>
<td>- [Acceptance] review is a summary of [system] [test];</td>
<td>- [Bugs] are fixed progressively and improved continuously in [tests];</td>
</tr>
<tr>
<td>● Support decision making</td>
<td></td>
</tr>
<tr>
<td>- Weekly [reports] produce a “to do list”;</td>
<td></td>
</tr>
<tr>
<td>- Assign right tasks to the right [people];</td>
<td></td>
</tr>
<tr>
<td>- Accept or reject changing [requirements] or [needs];</td>
<td></td>
</tr>
<tr>
<td>● Change perceptions</td>
<td>● Learn about project</td>
</tr>
<tr>
<td>- Developers feel pressure before [acceptance] review; and</td>
<td>- Developers learn about [customer] [requirements] and its [technical] difficulty;</td>
</tr>
<tr>
<td>- The [test] is “frustrating”); but</td>
<td>- Both vender and client learn about [system] functionality, usability, reliability and stability;</td>
</tr>
<tr>
<td>- They feel “a sense of achievement” after pass it;</td>
<td>- Vender learns best [project] management practice as a growing company;</td>
</tr>
<tr>
<td>- Specified [technical] standard make the [project] [team] feel fair and equal;</td>
<td>- Client learns advanced technology in data security;</td>
</tr>
<tr>
<td>● Learn about project:</td>
<td>● Achieve commitment:</td>
</tr>
<tr>
<td>- Client learn about the [system] [process] from weekly [reports];</td>
<td>- Mutual understanding and trust is achieved via [communication] between development team and client;</td>
</tr>
<tr>
<td>● Project delivery process</td>
<td>● Change perceptions</td>
</tr>
<tr>
<td>- [Tests] are the “gatekeepers” at each milestone;</td>
<td>- Client satisfaction increased progressively as they see a [better] system at the [test] stage;</td>
</tr>
<tr>
<td>- [Acceptance] review is the closure point of the project;</td>
<td></td>
</tr>
<tr>
<td>- [People] [involved] can be disengaged after [acceptance];</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Table 4. Use of IS Evaluation in CMSecu
5. DISCUSSION

5.1 IS evaluation

Our results suggest that evaluation takes place at various stages of an IS project: pre-implementation, on-going evaluations during system implementation and post-implementation. At each stage, evaluation has various focuses on its content and different methods are used, reflecting different purpose or motivation of the evaluation. At the pre-implementation stage, evaluation serves the distinctive purpose of system or vendor selection. However, the process can take different forms. For example, considering external experts were always involved at this stage; they played various roles and had different significance. In the QHJIS case, the IT department fully depended on experts to assess the feasibility of the project proposal, and their only consideration was the price. In the JSNews case, the IT department conducted market research before they called for bids and they already had a fairly clear understanding of the hardware and software requirements. In this case, experts were only involved as “gate-keepers” to justify their decision. In the CNPower case, experts not only assisted the IT department in selecting vendors, they also had some power in approving or rejecting the selection. Nevertheless, the premier focus of evaluation at this stage tends to be on the feasibility, functionality and price of the proposed system. The evaluation outputs, or documents, commonly are a summative report that is submitted to the top managers to gain their approval and access to the funds.

During the system implementation stage, the focus of evaluation is on the system quality. The IS quality is often assessed in two aspects: whether the implemented system meets IS owners’ business requirements, or achieves a business-technology fit; and the implemented system meets certain technical requirements (often assessed in terms of functionality, stability, compatibility and security). The reason behind this situation might be due to the actual implementation process being largely driven by the IS providers and IT department. “If the system can run smoothly and meet all [customer] needs are [IS providers’] primary consideration” (CMSecu001). Hence, the focus of evaluation and approaches undertaken are also determined by IT professionals. Although only important issues are formally documented, many informal and/or instant findings can be resolved from such evaluations. The results can be both summative and formative. “They are a summary of a previous stage, as well as a guide for the next stage” (CNPower009).

After the system has been tested and in operation for a while, a post-implementation review (often referred as “Acceptance Review” in China), is usually performed. However, this review is often considered as a “business step” of a project, and it is focuses on reviewing “the accomplishment of the contract”. Therefore, it is usually conducted in a very formal manner. The focus of such reviews is not only on the system quality but also on many other issues specified in the business contract (e.g. required documentation, training and after-sale service). Subsequently, the “acceptance review” results are often “conclusive” and well documented.

5.2 Stakeholder involvement

Stakeholders who are actively involved in all evaluations are mainly the IT personnel: the IS owner IT department and the system provider. Experts from third party organisations are often invited into evaluations as an external control mechanism of the project, for their experience and knowledge in IS or business related area. However, in CMSecu case, no expert was involved because the implemented system is highly technical-oriented, and “not many [people] can do this” (CMSecu004) in China.

Users are not involved in evaluation until late stages of a project. Their involvement is often limited to participating in training (QJHIS), testing (JSNews), or answering questionnaires (CNPower) to provide their feedback. User departments often do not have much power in evaluation, for example in JSNews and CNPower cases. However, when the user department is also the IS owner, they will have strong impact on evaluation and its outcomes, as was the case with the CMSecu project. Although in QJHIS, the acceptance review is performed within each department, only some powerful users - the department managers, had influence on evaluation.
Meanwhile, top managers are not often directly involved in the evaluation. It is interesting to note that in some cases (QJHIS, JSNews and CNPower), although top managers were assigned as the leaders of a project team, they only presented at the initialisation and acceptance review stages. In most cases, their role in the project or evaluation is only a symbol of authority and top management support. For instance, a Vice President (CNPower009) comments that “[the system] requires [his] approval, as the representative of CNPower, to be fully alive”.

5.3 IS evaluation use

In these four cases, we identified a list of instrumental, conceptual and symbolic use of evaluation process and outputs for each case, as shown in Table 1 to Table 4 and summarised in Table 5 below.

Our results have confirmed two important aspects of instrumental use in IS context: to support decision making and problem solving. Both evaluation process and evaluation outputs can be used to support making decisions, in terms of vendor selection, project plan approval and system acceptance. Furthermore they can assist in problem solving, namely, supporting a continuous improvement of the system quality. Moreover, we also found that the evaluation process is used as a platform for communication for different stakeholders. Meanwhile, evaluation outputs can be either summative, to demonstrate a current situation (e.g. IS requirements reports, post-implementation review reports); or formative, to guide future actions (e.g. system design proposal, system test plan); or even both.

Conceptual use refers to the use in which no direct action has been taken but people’s understanding has been affected (Johnson et al. 2009). We found that the evaluation process takes a significant role in such use, because it is regarded as a “learning and knowledge accumulating process” (CMSecu003) that collects, analyses and interprets data from stakeholders, to understand issues related to the IS project. During the process, different opinions and ideas are communicated. Knowledge then can be transferred between different groups of stakeholders. Subsequently, stakeholders learn about the current situation of an IS project and their thinking about relevant issues is shaped. Progressively, a mutual understanding results and commitment to such understanding is achieved among stakeholders involved in the evaluation process. On the other hand, evaluation documents are very important to the stakeholders who are not directly involved in evaluation. Since they have limited access to the evaluation process, the only way that their thoughts on a relevant issue can be changed is via reviewing those documents.

<table>
<thead>
<tr>
<th>Instrumental Use</th>
<th>Conceptual Use</th>
<th>Symbolic Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Decision making: e.g. vendor selection, project planning and system acceptance;</td>
<td>• A process of learning of current situations: e.g. business process and system requirements</td>
<td>• A symbol of milestones, including project closure;</td>
</tr>
<tr>
<td>• Problem solving and performance improving;</td>
<td>• A process of knowledge transiting among various stakeholders;</td>
<td>• A symbol of good management style;</td>
</tr>
<tr>
<td>• Summative outputs: demonstrate a current situation;</td>
<td>• A process of achieving commitment or shared understanding;</td>
<td>• Empower or disempower stakeholders;</td>
</tr>
<tr>
<td>• Formative outputs: guide future action;</td>
<td></td>
<td>• Establishing personal networks;</td>
</tr>
</tbody>
</table>

Table 5. The Use of IS Evaluation

Lastly, it appears that the existence of evaluation process and results can be used symbolically. In CNPower and CMSecu, evaluation is scheduled at certain key time points or milestones as a delivery process of the system, and the production of evaluation outputs is often considered as the formal ending point of the milestones. Such approaches are believed to represent a good management style. Also, with all four cases, the completion of the post-implementation review is a sign for the closure of the project and project members are disengaged from the case entirely. Nevertheless, political use of
evaluation process and outputs is also an important aspect of symbolic use. The evaluation process can used as a tool to give voice to different opinions, therefore empowering stakeholders (QJHIS and CNPower), or it can be used to exclude someone from the evaluation (JSNews). Stakeholders established their personal networks during the evaluation process in JSNews case. However, the IS owner of QJHIS used it as a bargaining strategy to save costs. The evaluation documents are generally regarded as “credentials” for any possible conflicts after the case is closed, which are very useful for “tracking problems”. In other words, it increases the accountability of the stakeholders involved.

6. LIMITATIONS AND FURTHER RESEARCH

The aim of our research is to understand the utilisation of Information System evaluation as well as its relationship with the IS evaluation activities taking places and stakeholders involved in such evaluation. To achieve this, we first proposed a theoretical framework from both IS evaluation research and other disciplines where evaluation use has been studied before. By using this framework in the investigation of four different IS projects, the applicability of the framework has been demonstrated. The major findings that emerge from the cases are the identified uses of evaluation processes and outputs in an IS context. In this case, this paper contributes to the current research in two aspects: firstly, we believe it is the first attempt to understand the use of evaluation in an IS context, therefore it does not only an alternative focus in IS evaluation research, but also extends the current use of evaluation study into a new domain; secondly, we proposed a theoretical framework by integrating three important dimensions raised in IS evaluation and use of evaluation studies, which provides a systematic and holistic view for understanding the use of IS evaluation.

Nevertheless, the framework still requires further validation and development. The results showed in this paper are purely descriptive, and it only contributes to the details of each dimension of the proposed framework. It still lacks of supports for the relationships between each dimension. For instance, questions like how to what extent stakeholders can influence the different types of IS evaluation use and whether their influences are different under different involvement strategies remain unanswered in this paper, and it requires a more analytic and cross-case approach. Therefore, we suggest that future research includes firstly that similar exploratory studies conducted in different contexts to further identify possible use of evaluation process and output. Secondly, cross-case analyses need to be performed based on different stakeholder groups and involvement levels, to conceptualise the relationship between each dimension within the framework. Finally, the research conducted to date using the framework forms the basis for developing hypotheses in relation to relationships between dimensions that can be tested using survey methods applied to samples of IT professionals.
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