Critical success factors revisited: success and failure cases of information systems for senior executives

PoPo Poon *, Christian Wagner 1

Department of Information Systems, City University of Hong Kong, 83 Tat Chee Avenue, Hong Kong, People’s Republic of China

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Abstract

The literature suggests the existence of critical success factors (CSFs) for the development of information systems that support senior executives. Our study of six organizations gives evidence for this notion of CSFs. The study further shows an interesting pattern, namely that companies either “get it right”, and essentially succeed on all CSFs, or “get it completely wrong”, that is, fall short on each of the CSFs. Among the six cases for which data were collected through in-depth interviews with company executives, three organizations seemed to manage all the CSFs properly, while two others managed all CSFs poorly. Only one organization showed a mixed scorecard, managing some factors well and some not so well. At the completion of the study, this organization could neither be judged as a success, nor as a failure. This dichotomy between success and failure cases suggests the existence of an even smaller set of “meta-success” factors. Based on our findings, we speculate that these “meta-success” factors are “championship”, “availability of resources”, and “link to organization objectives”. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Executive information systems; Critical success factors; Critical failure factors; Information systems success; Case study

1. Background

The successful development of information systems for senior executives is not easy for any organization. Information systems to support senior executives have been available for well over a decade, initially as “executive information systems” (EIS), and today more frequently as EIS components of enterprise resource planning software (such as SAP/R3), on-line analytic processing (OLAP) software, or data warehouse access software. EIS and their derivatives have always been high-risk systems, offering usually only one chance to successfully implement them in the organization. Consequently, many failures have occurred [5,14], with estimates being as high as 70%. Technological, organizational, psychological and educational issues all contribute to making the implementation of such systems difficult [20,21].

In addition, although EIS and their successors are supposedly specifically tailored to top executives’ information needs, few executives made significant direct use of them. Fitzgerald and Murphy [9] found that only 32% of users were at executive level. Furthermore, the majority of executives did not rate EIS benefits very highly. The majority (68%) of
users was at middle management level. These middle managers were not using the systems on behalf of executives but for their own information needs. Nord and Nord [18] confirmed that vice-presidents and middle managers exhibited higher system usage than top executives.

Taken together, these facts illustrate that implementation success cannot be taken for granted, and that even successful implementations might not be used as intended. Furthermore, critical success or failure factors applicable to other types of information systems may not necessarily apply to information systems for executives (compare for instance critical failure factors in Flowers [10]). Hence, as EIS and their derivatives are offered by an increasing number of vendors and supposedly used by more and more organizations, understanding the determinants for their successful implementation and use becomes increasingly important. Interestingly enough, little research has been carried out concerning this subject matter. Although Rockart and DeLong [22] proposed a model of critical success factors (CSFs) for EIS over 10 years ago, little additional research of the core concepts and theoretical foundations was conducted in subsequent years [27]. The few studies that followed (e.g., Turban [25]), largely confirmed Rockart and DeLong’s factors through one or more cases.

Hence, to date, it has yet not been determined if the CSFs are universal in their application to different organizations, business environments and culture, or if they are an artifact of prevailing company and country cultures. A recent article by Bensaou and Earl [3] for instance hints at interesting differences between Western and Japanese IT management, with respect to the ways in which requirements should be determined or success should be measured. To shed more light on the critical link between CSFs and system success, six cases of information systems for senior executives from organizations in Hong Kong were analyzed over a time frame of 18 months. Some of the systems were new (2 years or less), whereas others had been in use for up to 6 years. The organizations chosen represent a number of different industries ranging from education, hospital, shipping, electric supplies, to railways and airways. Within each organization, several members were interviewed, to assess success from several perspectives.

The article is organized as follows. We will next briefly describe the meaning of system success and success characteristics. This will be followed by a review of CSFs and the selection of CSFs to be further considered within this study. We will then discuss research methodology, followed by results, and discussion. The manuscript ends with conclusions and suggestions for future research.

2. System success

It has been known for a long time that EIS (and their derivatives) are usually developed with high expectations, yet often end in failure [21,30]. So how can we define system success? Unfortunately, systems that support decision making are difficult or impossible to justify using standard economic evaluation methods. Keen [12] showed that defining and quantifying the benefits of a decision support system is very difficult. While the cost of an EIS can be estimated, putting a dollar value on the benefits is difficult since the benefits of EIS can be intangible and transient [22]. Nevertheless, Rockart and DeLong suggested that there is a hierarchy of four issues to consider when evaluating an EIS. In addition, other researchers, such as Cottrell and Rapley [6] or Rainer and Watson [21] have put forward additional criteria that can be used to determine EIS success. Based on their combined suggestions, we chose five evaluation criteria, which are introduced below together with the explanation for their choice.

2.1. Access: the EIS is made available and users are given access to the system

It is obvious that if the development team cannot make the system available to users, the users cannot access the system and the system, in this case, the system is unsuccessful. Even a seemingly available system can be difficult to access, if it requires complicated log-in procedures, or access from only a few dedicated terminals.

2.2. Use: the EIS is used by the intended users

It is logical that if the system ceases to be used, it cannot provide any benefit to users and then cannot
be seen as successful. Therefore, there is a need to ensure that the EIS is actually used by its potential users. As Rockart and DeLong [22] mentioned, how much time executives spend using the system can indicate the success of the EIS. Moreover, Leidner and Elam [13] realized that the frequency with which system is used is also one of the factors that reflect the success of EIS.

2.3. Satisfaction: users are satisfied with the EIS

User satisfaction is one of the most widely used indicators of success in information system research [15]. The level of users’ satisfaction will also have direct impact on whether or not the system is used [2]. So, if the EIS cannot satisfy its users, the users will not use the system anymore. As a result, the system will not be successful.

2.4. Positive impact: the EIS has positive impact on the executives and the organization

An EIS is successful if it has a beneficial impact on the executives and organization. As indicated by Rockart and DeLong [22], a successful EIS can improve the manager’s mental model of the company and Mintzberg [16] proposed that better decisions result from better mental models. Once the executives can make better decisions, a positive impact on the organization is obtained.

2.5. Diffusion: the EIS tends to spread

Another feature to indicate successful EIS is that the number of people using the system increases after the initial users have tried to use the system [22,29]. Once the non-users perceive the system can provide benefits to them, they may request access to the system. In addition, once EIS users found that their colleagues gain positive impact from the system, they may promote the system to other colleagues. As a result, the number of EIS users will steadily rise. Santosus [23] describes this phenomenon for a successful EIS implementation at Motorola, where success meant an increase in the number of users, applications, and platforms through which the EIS was delivered (spread and growth).

Absent from our success criteria list are factors that refer to implementation issues. Of course, the most basic level of success for any EIS is whether it is completed in the first place vs. its remaining in analysis design or prototyping stages. In fact, several failure cases in our study failed early, never getting beyond the prototyping stage.

3. CSFs reviewed

In the previous section, we introduced success criteria, the measures of success for systems (and operationalizations of our dependent variable). Our focus will now move to what is frequently called “critical success factors”, namely the conditions that need to be met to assure success of the system. In other words, they are operationalizations of our independent variable.

The most comprehensive investigation of success factors for EIS implementation is still the work by Rockart and DeLong in 1988 [22]. Prior to it, there was no clear agreement on the factors that are most significant in making the implementation process successful or to identify the best development process to follow. Rockart and DeLong [22] observed 30 cases, where attempts were made to implement EIS. From these, they extracted eight areas that appeared to be the most important to EIS success. Both executive users and developers also deemed all eight factors most important.

Several other researchers (Paller and Laska [19], Bird [4], Watson et al. [30], Whymark [31], Rainer and Watson [21], Turban [25], McBride [14]) have subsequently reconfirmed the factors observed by Rockart and DeLong. Follow-up research has shown considerable agreement on two additional factors. Each of the factors is described below in some detail.

3.1. Committed and informed executive sponsor

Most studies recognize the importance of an executive sponsor who is both sufficiently committed to the system to invest time and effort in guiding its development, and has a realistic understanding of the capabilities and limitations of the system. A detailed discussion of the importance of commitment and
factors influencing commitment for IS projects can be found in Newman and Sabherwal [17].

3.2. Operating sponsor

To leverage the time of the executive sponsor, it is necessary to have an operating sponsor designated to manage the details of implementation from the user’s side. This sponsor should be well acquainted with the executive sponsor’s way of working.

3.3. Appropriate IS staff

The quality of the staff that support an IS for senior executives is important. The project manager should have technical as well as business knowledge, and the ability to communicate with senior management. Support staff must be sophisticated enough to interact with top management and be able to master the technologies required for the system.

3.4. Appropriate technology

The choice of hardware and software has a major bearing on the acceptance of a system. In the past, a barrier to executive support was the lack of hardware and software that fit with the demands of highly variable work styles and environments of executives. As more specifically designed products have become available, this problem has diminished. Development is now often replaced by selecting the most appropriate system on the market.

3.5. Management of data

The ability to provide access to reliable data from both internal and external sources, is a major issue in the system development. Aggregating, accessing and extracting data from a number of subsidiary databases can be a stumbling block to the implementation of an IS suitable for executives.

3.6. Clear link to business objectives

The system must solve a defined business problem or meet a need that can be addressed effectively with IS technology. There should be a clear link to business objectives and clear benefits in using the technology. The system must provide something that would not otherwise be available and add value to the data.

3.7. Management of organizational resistance

Political resistance is a common cause of implementation failure. Because an IS for executives can alter the information flow in an organization and shift the power relationships within a company, there may be resistance to its introduction and operation. Handling of this potential conflict source will remain an issue throughout the life of the system. Dragoon [8], for instance reports on the case of Eli Lilly, where a “standardized” EIS needed to be implemented against the resistance of individual groups who insisted on keeping their own data collection techniques.

3.8. Management of system evolution and spread

An installation that is successful and used regularly by the executive sponsor will almost inevitably produce demand by peers or subordinates for access to a similar system. Managing this process of “spread” means identifying the specific job function, technical orientation, work style, and specific information support needs of each potential user, and taking that into account when expanding the system.

3.9. Evolutionary development methodology

An evolutionary development methodology is widely acknowledged as a key factor for system success [11,22]. The most common way of finding how the technology can provide value for the executive is through prototyping [22]. This also keeps the executives aware and hopefully enthusiastic concerning the project [1].

3.10. Carefully defined information and system requirements

A key design issue is identifying the executive user’s information requirements [28]. A successful system can only be delivered when the executives’
needs are understood. Getting executives to specify what they want is not an easy task. Paller and Laska [19] and Bird [4] also pointed out that identifying executives' information requirements was the biggest challenge faced by the development team. Vandenbosch and Huff [26] identified differences in executive information needs based on different information search behavior. And Davenport [7] points out that even experienced IS consulting firms may find it difficult to identify executive information needs.

In order to investigate the CSFs involved in implementing an EIS in Hong Kong, all 10 factors were used to predict the success of EIS development in this research.

4. Methodology

4.1. Research model

Using the above defined concepts of EIS success and CSFs, the study considered a basic EIS success model, as illustrated in Fig. 1. The model postulates that the presence of the 10 CSFs would result in the success of the information system (as measured by the five success factors), while the absence of the CSFs would lead to failure of the project. This is a strong interpretation of the CSF concept, treating the CSFs as both necessary and sufficient conditions for system success.

Thus, we expected that organizations that did not manage all CSFs right would incur project failure, or at least a project outcome below company expectation (“non-success”).

4.2. Research sites

To assess the importance of the 10 previously identified CSFs, we studied six Hong Kong organizations that had implemented information systems for senior executives. The organizations included both private and public companies and government institutions. The six organizations are labeled here by an alias, describing their principal business:

1. Major Railway Corporation,
2. International Airline,
3. Health Care Provider,
4. Large University,
5. Utility,

4.3. Data collection

The research was conducted through a series of personal interviews with several key personnel in each organization. While many questions were open-ended, questionnaires were sent before the interview, thus ensuring that all interviews followed the same general format and that interviewees could provide more informative data.

Interviewees were asked to complete the questionnaires before interviews were held. There were two sets of questionnaires, one for companies still using the system, another one for those who had stopped using the system. The questionnaires are shown in Appendices A and B, respectively. Interviews were conducted with internal developers who developed the systems in-house, external consultants who helped guide the development process, software vendors EIS, and users. The face-to-face interview protocol followed the questionnaire questions in order to focus on the aspects that were the most relevant to system success and failure. Both developers and users were interviewed. Developers included both the internal IS department in each organization and external consultants. System users were executive managers and middle managers. Observational visits of the organizations were also conducted to watch the systems in use.

The study did not produce quantitative data, nor was any attempt made to quantify essentially qualitative data. In many cases, we were simply looking for the absence or presence of a particular factor (e.g., was there an operating sponsor?), while at the same
time checking whether that characteristic was fulfilled only superficially, or in a meaningful way.

5. Results

5.1. EIS success

After questionnaire and interview results for all six organizations were analyzed, three success cases emerged, two failure cases, and one unresolved case. The two failure cases were identified both by a lack of benefits derived by the firm, and by the decision to discontinue the use of the EIS in both cases. In other words, they were true failures. The unresolved case was identified by a situation where the system was actually used, but only at a small fraction of its functionality, benefits had not yet been clearly realized, and that no future expansions were planned at the time of the study. While this was not an abandoned system, it had not met expectations and thus met our definition of a “non-success”, given in the previous section. Table 1 shows in more detail how the six cases measured up against the previously introduced list of success measures. Each case received a qualitative summary rating for every success measure. A measure rated as “Good” means that most of the users agreed the measure was well achieved. An “Acceptable” rating indicates marginal performance of the relative success measure, with some signs of success. For example, system use was marginal at Large University. Some users considered the system to be successfully employed while others did not. The underlying issue was that system use was optional, and that executives were able to obtain the data through other means as well. Hence, the system did not play a strategic, but merely a support role. A case rated “Poor” reflect high agreement among users that the success measure was not well achieved.

5.2. CSFs observed

To demonstrate how EIS successes and failures stacked up against the management of CSFs within the six organizations, we compiled summaries of relevant CSF performance data in Table 2. For each organization, management of each CSF is rated through a summary rating of ⬤ for “CSF well addressed”, or × for “CSF ignored”. In addition, the summary ratings are supported through factual data from each case.

The results emphasize the importance of CSFs. When all factors were present, the system succeeded; when they were absent, the system failed. In one unresolved case, some factors were present and others not, with the result being undecided.

Table 1
Success criteria for the six case studies

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<tr>
<th>Success Measures</th>
<th>Major Railway</th>
<th>International Airline</th>
<th>Health Care Provider</th>
<th>Large University</th>
<th>Utility</th>
<th>Shipping Company</th>
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Note: ⬤ Good ⬤ Acceptable ⬤ Poor
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<th>Critical success factors</th>
<th>Major railway (successful case)</th>
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<th>Shipping company (failure case)</th>
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<td>1. A committed and informed Executive Sponsor</td>
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<td>'The Chairman and Chief Executive.' He keeps the EIS project highly visible in the organization. 'He ensures the resources and political support needed for the EIS to survive.' He encourages other board members to follow suit.</td>
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<td>'The Outport Sales Managers at Hong Kong, Singapore and London.' They make the initial request for the EIS. 'They stay on top of the EIS development, providing direction and feedback.' They communicate strong and continuing interest to the EIS developers and data providers.</td>
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<td>'More than 15 senior executives.' They make the initial request for the EIS. 'They initiate the system and make hands-on use of the system.' They keep constant pressure on the EIS project team.</td>
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<td>'The University President and the Director of Planning.' They make the initial request for the EIS. 'They initiate the system and make hands-off approach to managing the EIS project. However, he ensures the resources support needed for the EIS.' The Director of Planning initiates the EIS.</td>
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<td>'The Director of the organization.' He never sets any deadline for the EIS project. 'Loss of sponsorship after the director lost interest on the EIS.' No sponsorship means no commitment to the allocation of resources.</td>
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<td>'The Managing Director.' The EIS project is defined with clear objectives initially. 'The EIS project has a clear visibility since all executives are told what the objectives of the system are.' The Managing Director decides he does not have sufficient time to oversee the EIS project. 'He delegates it to the Corporate Business Plan Manager.' Loss of sponsorship since the EIS project lost direction from the Managing Director.</td>
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2. An Operating Sponsor

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<td>17 Division Heads. They commit resources and time. They participate in the EIS development. They promote use of the EIS. Their endorsement of the EIS commands respect and interest among others.</td>
<td>The three staff from the Sales Department at the Headquarters. They commit time and energy to the project. They encourage other outport managers to use the EIS. They communicate easily with both the EIS users and the EIS team. They serve as a go-between helping to match business needs with technological capabilities.</td>
<td>The ITD Manager. She helps the executives and designers build constructive interactions and communication. She is a system champion on a day-to-day basis and takes on the responsibility for collecting data. She helps executive users to understand the EIS capabilities and limitations. She protects the design team from top management pressure.</td>
<td>The Administrative Officer of the Director of Planning. She represents the business side and works with the vendor handling day-to-day issues of development. She communicates with the EIS users and data providers. She translates users' needs to the design team. She is responsible to match business needs with technical capabilities.</td>
<td>No clear single operating sponsor role is assigned although the executive sponsor cannot make sufficient time for the EIS project.</td>
<td>&quot;The Corporate Business Plan Manager.&quot; He acts in the Managing Director’s stead to manage the EIS project. He is not acquainted with the executive sponsor’s way of thinking. He does not understand the Managing Director’s operating focus.</td>
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A team approach is adopted, which includes IS staff in partnership with external consultants, sponsors and data providers. IS staff come from database management, technical support, and user computing. External consultants work with executives and IS managers to describe what is ultimately expected from the EIS. They help define the information and capabilities for the initial EIS. They help select EIS hardware and software and then build the EIS. They provide follow-up observations and commitment after the EIS is built. The team has both technical excellence and business expertise about the information sources and executives' needs.

"A team approach is adopted, which consists of IMD staff and the representative from the Marketing and Sales Department. The IMD staff include system analysts, system designers and programmers. They form an independent quick-response team that experiments with quickly constructed prototypes. The other representatives have sophisticated business knowledge to identify executive needs and information sources. They have skills of business orientation and salesmanship to promote the EIS.

External consultants help select hardware and software that provide a flexible, user-friendly front-end tool, and create a database that provides necessary data for the EIS initially. The EIS team involves the ITD Manager, internal technical supporters, business information analysts and data providers. The internal IS staff evaluate hardware and software, install LAN and write routines that download to the EIS. The business information analysts help executives decide which information the EIS should contain. The ITD Manager is assigned as the EIS coordinator who is in charge with understanding the executives' business, reporting systems, critical data, and desired presentation formats. She helps manage the evolution and spread of EIS.

External consultants with the help of the operating sponsors and the users develop the initial version EIS. Consultants help select EIS hardware and software. They train IS staff to maintain the EIS. They offer consulting services after the initial EIS is developed. Internal staff confronted with problems after the external consultants left. Internal staff are unable to continually enhance the EIS to meet users' new requirements.

The EIS is developed by the internal IS staff who are led by a newly recruited EIS project manager. No one is assigned to handle the EIS project after the departure of the EIS project manager. Internal IS staff lack experience with EIS development. There is lack of human resources to complete the project. Other IS projects compete for scarce IS resources at the same time. The IS staff are unable to continually enhance the EIS to meet users' new requirements.

The EIS is fully developed by external consultants. They help define the information and capabilities of the system. They clarify corporate responsibilities, commitments, and resources. They help select EIS hardware and software. Internal IS staff only help solve technical problems. "External consultants lack understanding of the executive environment.

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</table>
5. Management of data

- The system produces data in novel formats. *The system adds value to the existing reports.*  
- Data are timely, reliable, accurate and consistent. *The system consists of required hard and soft data, internal and external data.*

- Users can only get the data in the EIS; those data are not available from other sources. *Data are timely, reliable, accurate and consistent.*  
- The system consists of required hard and soft data, internal and external data.

- The desired data are obtained, and are readily available for the EIS. *They verify the feasibility of obtaining information before committing to incorporate it into the EIS.*  
- Data are timely, reliable, accurate and consistent.

- The system reproduces data that are already available on paper. *Data are not updated and are incomplete.*  
- No external data are provided.

- They are unable to obtain the desired data for the EIS even if it is internal. *This increases the time of the EIS development.*  
- Users cannot get their desired data from the EIS, both internal and external. *Data are not provided on time.*  
- Data are not presented in desired formats. *The system duplicates paper reports.*

6. Clear link to business objectives

- Key performance indicators are identified. *A key business opportunity is focused.*  
- Benefits of using the EIS are defined.

- A link from the EIS to the objectives of the business is defined. *The critical success factors are already defined before the commencement of the EIS project.*

- The EIS is developed to meet the business objectives that are identified by the top management. *A link between the EIS and business objectives is defined.*

- The EIS is designed to link its capabilities directly to the users’ information need. *The value of the EIS is defined.*

- EIS does not have a clear link to business objectives. *EIS is not perceived as important by the executives.*

- EIS is not started with any specific business problem and need. *Users do not understand the objectives and benefits of using EIS.*  
- EIS has no clear link to business objectives.

(continued on next page)
Table 2 (continued)

<table>
<thead>
<tr>
<th>Critical success factors</th>
<th>Major railway (successful case)</th>
<th>International airline (successful case)</th>
<th>Health care provider (successful case)</th>
<th>Large university (unsuccessful case)</th>
<th>Shipping company (failure case)</th>
<th>Utility (failure case)</th>
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<td>7. Management of organizational resistance</td>
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<td>A majority of users are willing to use the system.</td>
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<td>Resistance is handled by education and negotiation.</td>
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<td>All outport managers are keen to use the system.</td>
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<td>Resistance is managed by training and communication.</td>
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<td>Resistance is found initially due to the unfriendly user interface and slow response time.</td>
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<td>Data providers and middle management do not co-operate with the EIS project manager.</td>
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8. Management of system evolution and spread

| Spread from 17 division heads to over 40 managers. |
| Users are consulted on a regular basis. |
| New modules or refinements and enhancements are carried out following their comments. |
| Spread from six outport managers to over 60 outport managers. |
| New features and functions are added to meet increasing user requirements. |
| Spread from 50 executives in the Headquarters to 500 over 40 hospitals. |
| They add extra modules continually. |
| They encourage user participation to express their needs. |
| Spread is reasonable, from 50 users to 100. |
| They have no evolution due to inadequate human resources. |
| They add extra modules continually. |
| They encourage user participation to express their needs. |
| They have no planning for EIS spread and evolution. |
| They have no logical follow-up. |
| There is no spread since the EIS project is stopped. |
| Resistance is not made to respond to users' needs. |
9. Evolutionary\textsuperscript{*}/Prototyping\textsuperscript{b} approach

- Without using evolutionary or prototyping approach.
- Without using evolutionary or prototyping approach.

10. Carefully defined information and system requirements

- They define a view of what the EIS is intended to achieve. * They review the existing management reports. * They interview executives and personnel who work for executives. * The design is capable of meeting the requirements of different executives.
- They arrange on-site meeting with the EIS users at each outport. * EIS is customized to meet the information requirements of each outport manager.
- They not only ask management, but also ask the personnel who support management. * They encourage users to devote time to try the EIS prototype.
- They just review the existing reports to define information requirements. * They have not carefully defined real users' needs.
- Executives cannot devote time to the EIS project. * Information and system requirements cannot be clearly defined.
- Users are unable to articulate their information requirements.
- Users do not have time to discuss with the consultants.
- External consultants have problems to understand users' needs because of a lack of familiarity with the business.

\textbullet \textsuperscript{*} CSF well addressed. \textbullet \ textsuperscript{x} CSF ignored.

\textbullet \textsuperscript{*} Iterative process to let developers design the system in parts but parts are carefully defined.
\textbullet \textsuperscript{x} Iterative process to let users test each part of the system.
6. Discussion

Our study clearly supported the importance of CSFs for system success. However, it also showed a very interesting pattern related to the absence or presence of CSFs. Simply stated, the three success cases seemed to manage all CSFs right, while the two failure cases seemed to manage all of them wrong. This suggests two things.

First, there might exist a smaller number of meta-CSFs, which, if managed correctly, result in all others to go right as well, or vice versa. Why so? In essence, without the presence of such meta factors, it would require a high level of coincidence for us to see the very clear patterns of success and failure. Furthermore, previous research, including the study of EIS at British Airways [6] suggests a smaller number of very CSFs. Second, the failure cases are so drastic in their failure, one might suggest that they had been meant to fail. Apparently, there were forces in the organizations that wanted the EIS to fail, and pursued this goal in a very systematic way.

Six cases are too few to identify meta-CSFs with any certainty. However, based on our analysis of interviews and questionnaires, and especially the focus on the yet unresolved case (large university), together with the data from the British Airways study, we can make several educated guesses. Large university did well on championship, having both executive and operating sponsors. As the BA study suggests as well, championship is a fundamental factor. For large university, it was one of few that had gone right and that had given the system enough impetus to get well under way. Large university did not do well on availability of resources, neither on people resources, nor appropriate technology, nor financial resources. This seemed to be a fundamental missing factor. In the BA study, availability of resources, especially staff resources, played a major role. Furthermore, one of our success cases (major railway) seemed to clinch success through very “deep pockets” that allowed the company to obtain any necessary technology (and technology infrastructure), so that lack of resources never became an issue. Finally, the unresolved case suggests the importance of one more factor, namely the tight link to business objectives. This was a factor that was present in all successful systems, also present in the unresolved case, but absent in the failure cases.

Clearly, executives will have a strong bottom-line orientation, and very limited time to hunt for benefits. Thus, a system that can clearly demonstrate benefits, by being linked to business objectives, will have a strong selling point with respect to user acceptance. Reflecting on the factors, we might also suggest a temporal consideration. Even before an EIS development is launched, it will require strong sponsorship to result in its initiation and seed resources. However, as the implementation continues, operational factors, such as resource availability (people, technology and money) become a necessary condition. And finally, as the system moves into use phase, while continued executive sponsorship and resources are required, a system will receive little use if it cannot establish clear benefits.

The two failure cases and their peculiar complete-failure condition, offer some evidence for the presence of additional critical failure factors. Apparently, the two organizations did not want an EIS to succeed. Comparing the two failures with the other cases in our set, interestingly, they also represented the only two organizations with a Chinese management system in place. In the Chinese management system, the owner typically makes all strategic and major personnel decisions and the delegation to middle management is low [32]. Direct supervision of work and personal reporting relations are more important forms of control, and the formal information system is often ignored and bypassed in the Chinese management system [32]. Therefore, at Utility, the top management preferred to receive data through informal personal reporting rather than through an information system. On the other hand, support staff members at Utility wanted to maintain their influence by providing critical data for the top management. Therefore, they were unwilling to change, fearing of loss of influence once top management would be able to circumvent them by accessing the information system. Hence, it was no surprise that the staff of Utility (as well as the staff of Major Shipping) was unwilling to supply data for the system. At Major Shipping, the data providers and middle management did not co-operate with the EIS project manager. At Utility, the IT manager
reported that the corporate culture was not ready for the system’s development.

This factor is different from the CSFs “clear link to business objectives” and “management of organization resistance”. The management system, which might not be based on formal written rules, but on people’s experiences and beliefs of what it takes to get ahead in the organization, may be opposed to business objectives. Consequently, if strong enough, the management system may cause initiatives to fail (by delaying them, or denying them some of their benefits) that otherwise could have been beneficial for the business [24].

Mismatch of the information system with the organization’s management system should also be differentiated from “normal” organization resistance, which might be considered a generic fear of the unknown, or the “fear based culture”, which illustrated by Flowers [10]. In our failure cases, there seemed to exist an interest in letting the system fail rather than a lack of interest in system success.

7. Conclusions

With the growing influence of information systems for executives, OLAP, and EIS components of ERP software, understanding system failure and success is becoming more important as well. Associated with EIS is a trend that is OLAP (on-line analytical processing). In contrast to on-line transaction processing (OLTP), which focuses on order entry and other transaction-processing systems, OLAP includes decision-making systems for marketing, sales, and finance. OLAP is a way of looking beyond transactions to forces driving them. It can help companies accurately forecast sales in order to better plan inventory and production levels, know where advertising is working and where they are wasting millions of dollars, and determine if their products are correctly priced.

In our study, we were able to confirm the applicability of all of Rockart and DeLong’s original eight CSFs, as well as two additional factors. Yet based on our findings, we suggest that organizations may “get it right” simply by managing three factors, championing at the executive and operational levels, resources, and linking the system to business objectives. We also saw evidence that these systems cannot succeed if they contradict the prevailing management system. As usual, companies that believe they can solve their problems with an information system will likely fail. Those that translate business goals into corresponding information needs and then into a well-managed system will likely succeed.
Appendix A

Questionnaire for companies still using their EIS

Personal Particulars

Company: __________________________  Position: __________________________
Name: ____________________________  Tel.: ____________________________
Department: ________________________  Date: ____________________________
Address: __________________________

1) When did your company propose an EIS?

_______________________________________________________________________

2) Why did your company propose an EIS?

_______________________________________________________________________

3) Who requested the EIS?

□ Board Director  □ Executive  □ MIS Manager
□ Others (please specify) ________________________________________________

4) When did the EIS start to be used?

_______________________________________________________________________

5) Which levels of staff can use the EIS?

_______________________________________________________________________
6) How many EIS users are there in your organization now?


7) Which functional areas can use the EIS in your organization?

☐ Finance  ☐ Accounting  ☐ Human Resources
☐ Marketing  ☐ Administrative  ☐ Manufacturing
☐ Sales  ☐ Customer Services  ☐ Operations
☐ Others (please specify) __________________________________________

8) What are the uses of the EIS?

☐ Budget  ☐ Strategy or Plan  ☐ Performance Evaluation
☐ Forecast  ☐ Communication  ☐ Tracking and Control
☐ Others (please specify) __________________________________________

9) Do you have any statistics on the utilization rate of the EIS usage?


10) How did you acquire the EIS?

☐ by in-house development in your MIS department
☐ by hiring external consultants to develop the system
☐ by purchasing a commercial package (Pls specify) __________________________
11) What development methodology did you use for the EIS implementation? (e.g. prototyping?)

12) Who is responsible for defining executives' requirements?
- [ ] MIS staff
- [ ] Executives' business advisors
- [ ] Users themselves
- [ ] External consultants
- [ ] Others (please specify)

13) Who manages the day-to-day development of the EIS?
- [ ] Managing Director
- [ ] Senior Executive
- [ ] IS manager
- [ ] Others (please specify)

14) What types of data does the EIS provide?

15) What types of functions does the EIS provide?

16) What is the hardware configuration of the EIS? Did you use the existing hardware or invested in new hardware for the EIS?
17) Do your internal IS staff support the EIS? Is there any external consultant assisting with the development and maintenance of the EIS?

18) What resistance and difficulties did you encounter during the development and implementation?

19) How did you deal with the EIS evolution and spread? (evolution: the growth of the EIS application set available to user, spread: the increase in number of executives and subordinates who can access to the EIS)

20) What other valuable experiences of the EIS development would you like to share?

- END -
Appendix B

Questionnaire for companies which abandoned using their EIS

Personal Particulars

Company : ___________________________ Position : ___________________________
Name : _______________________________ Tel. : ____________________________
Department : _________________________ Date : _____________________________
Address : ____________________________

1) When did you propose your EIS?

________________________________________________________________________

2) Why did you propose the EIS?

________________________________________________________________________

3) Who requested the EIS?

☐ Board Director ☐ Executive ☐ MIS Manager
☐ Others (please specify) __________________________

4) Which levels of staff could use the EIS?

☐ Board Director ☐ Executive ☐ Manager ☐ Assistant
☐ Others (please specify) __________________________
5) How many EIS users were there in your organization?

6) Which functional areas could use the EIS in your organization?

- Finance
- Accounting
- Human Resources
- Marketing
- Administrative
- Manufacturing
- Sales
- Customer Services
- Operations
- Others (please specify) ________________________________

7) What were the uses of the EIS?

- Budget
- Strategy or Plan
- Performance Evaluation
- Forecast
- Communication
- Tracking and Control
- Others (please specify) ________________________________

8) How did you acquire the EIS?

- by in-house development in your MIS department
- by hiring external consultants to develop the system
- by purchasing a commercial package (PIL specify) ________________________________

9) What strategy did you use for the EIS implementation? (e.g. prototyping?)


10) Who was responsible to define executives' requirements?

- MIS staff
- Executives' business advisors
- Users themselves
- External consultants
- Others (please specify) ________________________________

11) Who managed the day-to-day development of the EIS?
12) What types of data did the EIS provide?


13) What types of functions did the EIS provide?


14) What was the hardware configuration of the EIS? Did you use the existing hardware or invest new hardware for the EIS?


15) Did your internal IS staff support the EIS? Did any external consultant assist with the development and maintenance of the EIS?


16) What resistance and difficulties did you encounter during the developing and implementation?
17) How did you deal with the EIS evolution and spread? (evolution: the growth of the EIS application set available to user; spread: the increase in number of executives and subordinates who can access to the EIS)

18) When did you stop to use the EIS?

19) What was your implementation process stage when the EIS was abandoned?

☐ EIS was fully developed and operational
☐ EIS was fully developed
☐ EIS was in the prototype stage
☐ EIS was in the design stage

20) Why did you give up using the EIS? (Pls check the following reasons as appropriate, and add your comments if necessary)

☐ Inadequate technology (please check the following examples)
   ☐ EIS could not filter, extract information
   ☐ text-only display instead of enhanced graphics or icons
   ☐ function keys to access screens and functions instead of touchscreens of a mouse
   ☐ could not capture information at an acceptable speed
- Lack of sponsorship (no one support the EIS)
- EIS too complicated
- EIS perceived as unimportant
- EIS failed to meet objectives
- Insufficient IS resources
- Management not committed (lack of direct management commitment)
- Attempt to cost-justify EIS (did not view benefits as justifying the costs)
- Corporate culture are not ready for EIS
- Unknown objectives (EIS's specific objectives were not identified)
- Executive lost interest in their continued use
- Inability to define information requirements
- Data Integrity in doubt
- Organizational resistance
☐ Insufficient depth of information (lack of drill down capability to get detailed information)

☐ EIS not linked to critical success factors of EIS users

☐ Sponsor turnover (e.g. new CEO, canceled the EIS)

☐ Too much time required to develop applications

☐ Information requirements too detailed (but data are not ready in the organization)

☐ Vendor support discontinued

☐ Others reasons to give up the EIS (please specify)

20) Will you propose another EIS in your organization?

21) What other valuable experiences of the EIS development would you like to share?

- END -
References