

엔터프라이즈 시스템 구현의 핵심성공요소에 관한 연구: 프로세스이론을 기반으로 한 실패사례 분석

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A Study on Critical Success Factors for Enterprise Systems Implementation: A Failure Case Analysis Based on Process Theory

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■ Abstract ■

Although Enterprise Systems (ES) have promised major strategic benefits and process improvements from business and technology integration, their implementation has been plagued by a high failure rate and difficulty in realizing the promised benefits. For the purpose of understanding implementation failures, previous studies have focused on identifying critical success factors (CSFs) for information systems implementation. However, there has been little research on how these CSFs actually lead to successful results. In this study, based on process theory, we examined the process of ES implementation by explaining how the factors of ES implementation influence each other and how interaction among them produces results. Based on a failure case, we then developed a process model of ES implementation thus allowing us to explain the process of ES implementation. The proposed model facilitated an understanding of how repeating patterns of ES failure can be reversed. This model can be used for guiding new ES implementation projects.

Keyword : Enterprise Systems, Process Theory, Critical Success Factors

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1. Introduction

A significant growth in the number of Enterprise Systems (ES) installations world wide during the last decade represents a major paradigm shift in organizational and information systems management. A large number of enterprises are currently extending their base to ES or in the process of acquiring and implementing core ES modules. Unfortunately, such implementations have been plagued by high failure rates and difficulty to realize the promised benefits. One survey indicates that the failure rate in achieving the goals of ES projects ranges between 60% to 90% and nearly one in five are scrapped as total failures. This evinces greater interest for the researchers in the field of information systems (ISs) to develop a deeper understanding of ES and the implementation process in particular.

The high failure rate of ES implementations and the mixed results of such systems necessitate investigations that enhance our understanding of the issues involved in implementing these complex systems and also provide help with devising implementation strategies that lead to success. Over the past few years, many researchers [2, 3, 6] have carried out significant study about the process of ES implementations and the corresponding outcome and come up with a list of critical success factors (CSFs). Despite being equipped with such a list, the fact still remains that there is no clear understanding of the entire process of ES implementation. The situation is analogous to cooking with a list of ingredients, but without the recipe [11]. One approach to the problem is to develop a

process model [7, 14]. The process approach leads us to examine the implementation behaviours, to determine patterns that are particularly effective or ineffective in achieving successful implementation.

This study aims to develop the process model of ES implementation from a failure case, by which the process of ES implementation is explained. This study contributes to the Information Systems literature by providing an understanding into how the implementation factors influence each other and how interactions among them lead to the implementation results. The process model can be used for guiding new ES implementation projects.

2. Process Theory

Theories can be classified, on the basis of their logical structure, as variance theory or process theory [7, 8]. Process theory focuses on sequences of events (or 'state over time') to explain how and why particular outcomes are reached [1, 8]. Three meanings of the term 'process' have been articulated [14] : (i) a sequence of events that describes how things change over time; (ii) a category of concepts or variables that refers to actions of individuals or organizations; and (iii) a logic that explains a causal relationship between independent and dependent variables. Depending on the terminology used, a theory of 'process' consists of statements that explain how and why a process unfolds over time. Thus, a process model, the resulting 'pictures of the processes', reveals a detailed 'story' about the changes taking place within a tar-

get situation by explaining how objects interact, how they collectively lead to future courses of action, and the perceived constraints on their collective action [9, 10]. Therefore, a process model attempts to explain the occurrence of an outcome by identifying the sequence of events preceding it [12].

An understanding of the implementation process can be achieved only by delineating the network of causal relationships among the CSFs [3]. Thus, it is necessary to understand a complex IS implementation process in terms of preconceptions about the meanings of its parts and their relationships. By conceiving the process as influential sequences among implementation factors, this study adopted 'influence diagrams' [4] to represent influential relationships among factors in graphical form. These consist of a set of influential relationships. In each relationship between two factors, it is assumed that the influences of external factors on the two factors are constant. However, not all factors are judged to be equally important, so the process model focuses only on those that are critical to the trajectory of the IS implementation project [10]. To enhance the clarity of the diagrams, each factor in this study was designated in terms of its positive or negative direction (influence) by indicating the polarity of each link. Such influence diagrams can be created on the basis of the cognitive and intuitive thought processes of the researchers during the case study. Such a diagram facilitates the linking of pieces to the whole picture, and the interpretation of the influence of any one factor on others. This facilitates an understanding of the chain of

events that link the factors to success, and the laws governing them.

3. Research methodology

One of the informants, providing information for this analysis on the outcome of the ES implementation, worked as an internal SAP R/3 consultant for MCM Ltd, the company which purchased SAP R/3, to implement it along with the consulting company AA Ltd. The informant worked during the period April 2000 to August 2000 and has first hand information about the key events during the period. The activities where the informant was involved included part of customization, unit testing, user acceptance testing and the data conversion for the logistics modules. In addition, he also obtained information regarding the key activities and decisions made during the earlier phases of the project, *i.e.* from July 1999 to March 2000. He continued to receive the feedback regarding the progress of the implementation from his ex-colleagues of the implementation. The colleagues were the co-consultants as well as the key users with whom the informant was interacting during his tenure in the project. In addition, the authors managed to have a face-to-face discussion with some of the consultants who entered the project at a later stage and stayed until the project was abandoned. This gave enough details about the project activities in the last one year before the project was abandoned.

We conduct case analysis by identifying CSFs and the influential relationships among the CSFs. For this purpose, first, we identify

CSFs which are derived from the Somers and Nelson's [13] list. Second, we provide the interrelations between the CSFs by identifying the causal structure and the feedback loops between the various factors, which explain the state of events leading to the project result.

4. Case study

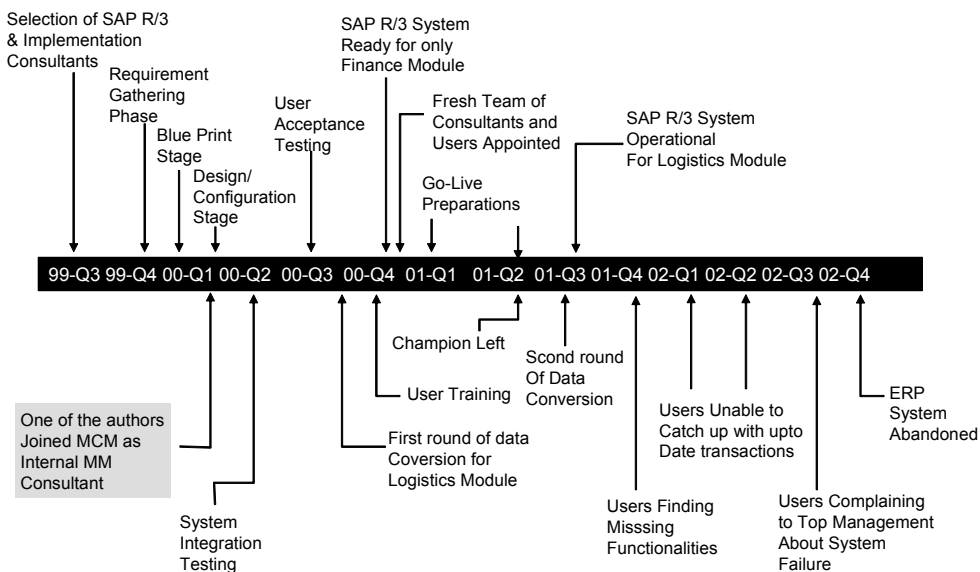
4.1 Company overview

MCM Ltd, a company well recognized in the furniture industry, began its operations as a small store in Singapore since 1980. MCM, whose annual revenue is US\$35 million in 2005, manufactures and exports furniture to more than 15 countries. Since globalization was a critical aspect of MCM's business plan, the CEO decided to invest in IT systems as part of the plan. The company made an initial investment of US\$ 1.1 million in SAP Financial, Logistics and Manufacturing

system. The Business Consulting division of AA Ltd was responsible for the implementation. Realizing that IT could enable them to compete with the other competitors, the CEO did not cut back on his IT investments. Cost was not the issue as he strongly believed that IT was the future. The CEO remarked in one of the meetings that he expected to spend about US\$ 350,000 annually to just maintain the system and was prepared to spend one percent of the annual revenue to upgrade and maintain the system. With this system, the company was supposed to have access to information in real time not only from their showrooms in Singapore but also from their franchise operations overseas.

4.2 ES implementation project

The history of the ES implementation taken up for this study spanned over a period of nearly 3.5 years starting from the 3rd quarter of



[Figure 1] Timeline for key events in ES implementation

1999 and ending in the 4th quarter of 2002. The timeline is depicted in [Figure 1]. The activities, events and outcomes for the project from beginning to end are split into different stages pertaining to the normal software development cycle. The description of the events tell rich story about what exactly happened during the different phases and are provided in the following paragraphs of this section, based on the information gathered from different sources as outlined in previous section.

(1) Proposal/contract award

During this stage, the top management was convinced about the urgent need for acquiring the IT infrastructure to aid in achieving the business goals. The SAP R/3 system was strongly recommended by the Group Financial Controller of the company. The management nominated him to initiate the process of inviting quotes from the relevant parties for implementing the system. There were several players at that time in the market including the called big five companies. AA Ltd, hereafter referred to as AA, was pitted against two top implementation partners of SAP AG. After several rounds of discussions and negotiations, the contract was finally awarded to AA on the basis of the lowest quotation and the recommendation from the Financial Controller. Subsequent to the choice of AA as the consulting company for carrying out the implementation, the management nominated the financial controller as the project champion to plan, organize and co-ordinate the rest of the project activities by liaising with AA and to ensure the success of the project. He had no background of IT and had

a very poor overview and understanding of the SAP R/3 product and relied heavily on AA for his success. However he was aggressive in his talk and could force his ideas on the project team on matters regarding the project schedules.

(2) Requirement gathering

When this phase started, the project team comprised of a project manager and consultants from AA and they were asked by the top management to report the progress to the nominated project champion. The consulting team comprised of a senior MM (Materials Management) consultant who was very competent to handle the users and with rich implementation experience, a junior consultant to assist her, a PP (Production Planning) consultant who had no prior implementation experience but just completed her certification from SAP, an SD (Sales and Distribution) consultant with a fair amount of SAP R/3 exposure but poor communication skill and an FA (Financial Accounting) consultant with no accounting background but hands on experience with SAP R/3 and a CO (Controlling) consultant with similar background of FA consultant. The users identified for providing the requirement to the consultants were those who had no idea about the features of SAP R/3. They were not briefed properly about their role in the proposed implementation and some of them were not even sure whether to set aside their time with the consultants. The requirement gathering exercise was much painful for both the consultants and the users. Looking at the unfavorable situation, the champion decided to recruit in-house SAP R/3

consultants to work in tandem with the AA consultants and four such in-house consultants for each module of MM, PP, SD and FA-CO joined the project team. Due to schedule pressure, the requirement gathering was completed somehow within two months and the project advanced to the subsequent blue print stage.

(3) Blue print preparation

This stage witnessed a lot of interaction between the MCM in-house consultants and the AA consultants. It is in this phase that the in-house consultants mobilized substantial confidence regarding the system requirements and some of them started questioning the validity of gathered requirements. There was no problem in the SD area as both in-house and AA consultant could work together in the interest of the project. However the MM consultant appointed by MCM had much stronger operational knowledge and so could quickly understand the requirements by discussing with the users in isolation. The PP consultant from MCM was found to be far superior in comparison to his AA counterpart. For this reason, there was a considerable amount of friction developed between them. The FA consultant from MCM side was a qualified accountant and had prior SAP exposure and could catch up well with the project progress. The AA project manager highlighted the problem faced in the MM and PP area to the project champion and he called them and advised to strictly follow the instructions of AA consultants. This resulted in considerable resentment. Again the blue print was prepared with many real require-

ments not duly taken in for consideration. Half of the blue print was a mere reproduction from the online documentation. AA's project manager somehow got it signed off from the key users and reported it as achievement of a milestone.

(4) Design and configuration

This was a challenging phase for the consultants, as they had to prove their system expertise by configuring the system. Most of the activities in this phase were confined to the consultants and there was no significant user interaction. The consultants carried out the customizing as per the blue print. The in-house MM consultant left the project during the period out of dissatisfaction. The in-house PP consultant was asked by the project champion to take over his role until a new replacement was found. Being new to the MM module and due to the schedule pressure, he felt he was unnecessarily overburdened. So he offered to quit on the ground that he was thoroughly misused. But he highlighted the incompetence of his AA counterpart and requested for her replacement. The proceedings were considerably smooth from the FA side. This was because the project champion took personal interest in the module as it concerned his department and offering secondary treatment to the logistics side of the project. Due to his frequent interaction with the project champion, the in-house FA-CO consultant could create an impression that he could manage the show without the involvement of AA counterpart and so the project champion forced the AA FA and CO consultants to quit the project

scene as a measure to cut costs. This caused considerable resentment for the AA team. At this point of time, the informant joined MCM as in-house MM consultant. But he ended up taking the additional role of PP module also from the outgoing MCM PP consultant. The same story regarding the misuse of consultants repeated again.

(5) System integration testing and user acceptance testing

The AA team had considerable edge over at this stage and again projected the progress of the project as having achieved another milestone towards completion. The system integration testing was conducted without a proper PP consultant and also an MM consultant freshly joining the team.

The user acceptance testing (UAT) script was prepared based on the system integration test results. The users showed excessive resistance to come and test the system for acceptance. Some of them felt that they could not understand about what was going on in the past few months. Most of the logistics users came for attending the UAT after top management intervened and directed them to allocate time for undergoing the testing. A considerable section of the users especially from the MM and PP module complained that the test script did not reflect what they actually do and started disowning the requirements in the blue print. Looking at the grim situation, the AA team made the in-house MCM consultants responsible for getting the sign off from the users. The matter was taken up with the project champion and he questioned the users for their non-

cooperation. They in turn complained to the top management about the project champion's mismanagement of the project by not giving the right direction to the users from the beginning. The CEO intervened and assured his full support for the survival of the project and sought everybody's cooperation to ensure that the project became a success.

(6) Data conversion

The AA team proudly announced in the steering committee that they managed to bring the project up to the stage of finishing the UAT and then onwards it would be the responsibility of the users and the in-house consultants to convert the master data needed as per the design requirement. The inventory controller in MCM prepared in excel spreadsheet the data pertaining to all the materials used in the company as per the format provided by AA and the data was uploaded in the system. But there was lots of missing information either unknown or yet to be gathered from different sources to complete the material master data. The vice president in charge of logistics operations was approached to help in providing the missing data and he asked for the print out of all the information about the materials loaded in the system. After looking at the list of materials, he sensed that the design of the numbering system was totally wrong and called for a meeting with everyone concerned in the project. It was evident in the meeting that the error had occurred due to the wrong requirement gathering and the wrong blue print and asked the whole consulting to revisit the requirement of MM module again. This caused a major set

back in the progress of the project. The AA team manager decided to withdraw the entire team from the project site. The inventory controller resigned from the company. The key PP user who participated in all the activities so far also resigned from the company. The informant who joined MCM also quit. The whole implementation was postponed indefinitely until the basic design was settled. But the consultants and users who were involved earlier were not around to carry out the necessary rework. The project team had only in-house FA and SD consultant who were also looking for jobs outside sensing the sure failure of the project. In fact they did so in two months time. Along with them the key finance users also left the project.

(7) Go-live preparations

The project champion did not give up even at this stage and he started the recruitment exercise all over again to locate experienced SAP R/3 consultants and a project manager to revive the situation. He succeeded in bring a fresh set of consultants and asked them to take an unbiased view of the situation and offer suggestions to bring the project back to normalcy. But because of their fresh entry and enormous pressure to turn around the situation, they were taking time to understand everything from beginning. It is at this point of time that the top management lost confidence and the vice president in charge of operations had a clash with the project champion and the HR manager. Both of them quit the company. But the top management found a replacement for the project champion.

(8) Post live support and maintenance

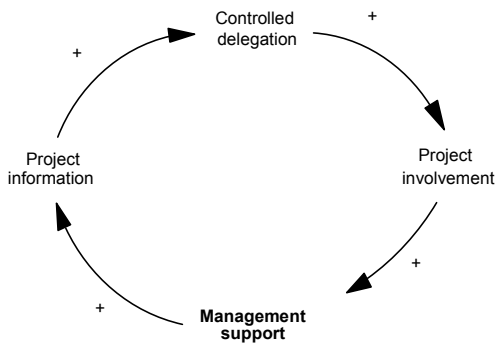
Nearly after 2 ½ years of beginning the project, the system went live with the new set of consultants and users. There was utter chaos after the system went live and many users could not carry out the daily transactions, as they did not receive proper training. The consultants could not provide the needed support because they were not that clear about the requirements. The pending transactions were piling up and the system could never carry out a real time transaction, as the users were always busy clearing the backlog operations. This was hampering the core operations of the business as too much time and effort were spent on the system on daily basis. Realizing that the system can no longer serve the original purpose for which it was intended, the top management decided to scrap the system after nearly six months of usage.

4.3 Case analysis

For examining the process of ES implementation, we identify eleven CSFs which are derived from the Somers and Nelson's [13] list. However, we reorder and reprioritize them based on our understanding of their strength and relevance in the context of the case study. We also identify and explain the sub factors involved for the breakthrough achievement in critical success areas. Based on each CSF, we examine the influential relationships among the identified factors.

(1) Management support

[Figure 2] illustrates the factors leading to increased support from the top management.



[Figure 2] Influential relationships around top management support

The management cannot confine their role to allocation of the required budget. They should also incrementally increase their involvement in project related activities. To do this, they should exercise controlled delegation of power to make decision on important matters. As they increase their involvement, it sends a positive signal about their support to the project and serves as a motivation factor for the rest to take active part. Due to their close association with the rest of the team, they get more information on project matters and so delegate less and less. It leads to more and more participation and the virtuous cycle continues.

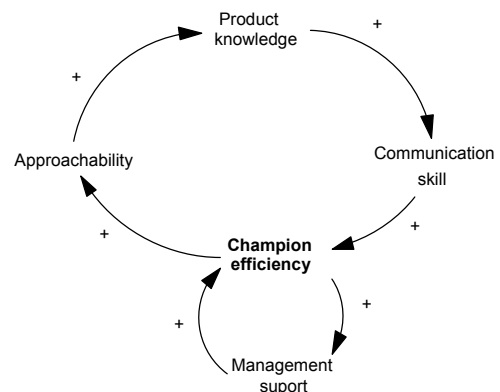
In MCM case, we found that the top management restricted their role to allocate the funds and nominate a champion and only relied on feedback from the champion and the project manager from AA ltd. This resulted in inefficient champion, poor user participation, misuse of consultants and high turnover of project resources.

(2) Project champion

Although the project champion need not

have a detailed knowledge about the product implemented, he can be effective in communicating with the top management to avail the support and pass on the decision to other project team members, motivate them and create the climate for the fullest participation and co-operation of all the stakeholders. For this to happen, he should also be approachable, understanding and able to get this done. He can acquire more and more knowledge about the product details as more people approach him for assistance and pass on the information which in turn increases his ability to communicate and his efficiency. In a similar way, he gets more and more comfortable and confident to do his duties as a champion when the top management offers more and more support in terms of providing the guidance and right decisions. The same is depicted in [Figure 3].

In MCM case, we found that the project champion could not get the proper management guidance and decision due to the hands off management attitude, which in turn resulted in his inability to communicate effec-



[Figure 3] Influential relationships around project champion efficiency

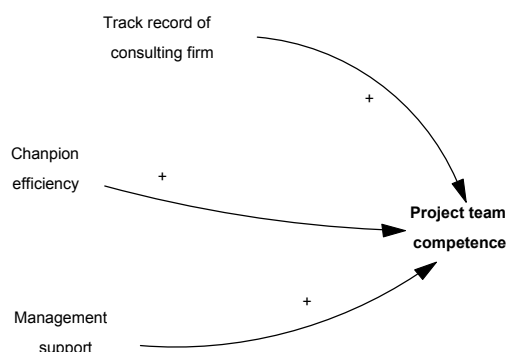
tively with the rest of the team. The team members could not approach him for important matters and he was not having a complete picture of the project at any point of time. This was leading to poor user participation, poor use of consultants and decreased competency of the project team and also lesser and lesser management support.

(3) Project team competence

The competence of the external and internal consultants and the project manager largely depends on their individual professional background. It is directly measured by their track record, which includes previous exposure to a similar project with the same complexity. But they also depend on the information from the top management, key users and the project champion. They need all this information in order to understand the exact requirements for the system to be implemented.

In MCM, we found that even though some of the consultants were skilled enough in the system, the project team could not even create a reliable and accurate user requirement document. The management did not brief the users upfront about the significance of the project and the project champion was not able to provide the clear direction and offer the facilities needed by availing the management support. This resulted in project team being handicapped to know what to do and how to do. One consultant remarked: “We are here for more than three months. Until now, we don’t even have a clear schedule showing the list of users to meet, their role and the agreed time and venue. Each one of us meets

different stakeholder in an informal way and nobody cares to know for what we have done so far.” The decreased competency of the project team resulted in failure to manage the project expectations.

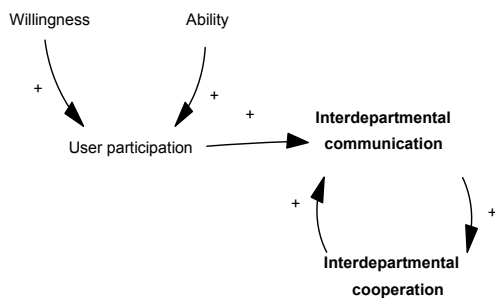


[Figure 4] Influential relationships around project team competence

(4) Interdepartmental communication

As the implementation progresses, more and more stakeholders representing diverse business functions and belonging to different organization structures are required to be contacted for gathering information and making decisions. So the stakeholders who are users in large proportion have to communicate to the project team and also among themselves to arrive at a consensus. As the ERP system involves integrating business functions, a decision made in one department may affect the operation of the other if there are processes with activities cutting across the departments. So the users representing all the departments have to effectively communicate to improve the interdepartmental co-operation. This adds to further communication between them and the reinforcement goes on a loop as depicted in [Figure 5].

Unfortunately, MCM could not see this happening. As the top management did not involve and offer support through the champion, most of the time the users representing the concerned departments did not know their role in the implementation and were confining to their daily routine. As the communication link was weak, correspondingly the project team could not witness the required co-operation among departments. This resulted in the project team not being able to manage the expectation at various stages.



[Figure 5] Influential relationships around interdepartmental communication and co-operation

(5) Interdepartmental co-operation

Interdepartmental co-operation is a result of interdepartmental communication. In addition, there should be an added involvement of top management and also the project champion to ensure the co-operation of all the parties involved and they should also play an active role in resolving any unwanted disputes among the parties. As illustrated in [Figure 5], more and more co-operation will lead to better communications among departments and lead to better co-operation.

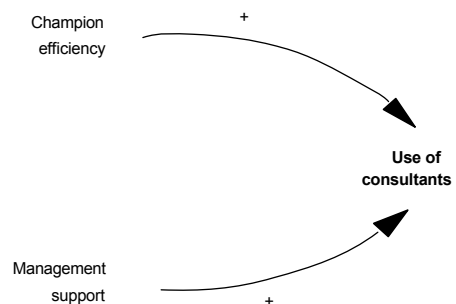
One of the peers doing the SD Module remarked: "Daily I go and meet the sales su-

pervisor to ask for the list of items and the pricing details. So far he did not provide me with the required data. I don't think I can configure the pricing conditions for so many combinations in such a short time." There were many such instances like this where due to lack of co-operation from the users; the required data was not made available in time resulting in poor management of expectations.

(6) Use of consultants

The top management and the champion managing the project are responsible for the effective utilization of the consultants by understanding their core strengths as in [Figure 6]. The top management can help in providing the necessary infrastructure needed for the project. The consultants should devote the maximum time in contributing in the special area identified for them. Any under utilization or wrong utilization will lead to their dissatisfaction and there is a strong possibility of their quitting the site in the middle. This causes the project team not having a dedicated, long-term resource.

It is quite clear from the MCM case, that



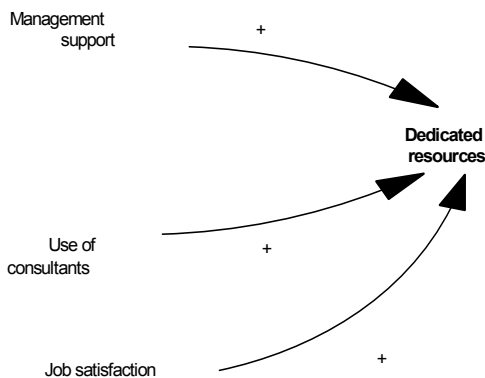
[Figure 6] Influential relationships around the use of consultants

some of the skilled consultants were not used to reap the benefits. The MM and PP consultants who were competent enough left the project after the design stage. The PP consultant was noted to quote, “Why I should involve in MM area. They should quickly find a replacement rather than asking me to take up an area I am not familiar with.”

(7) Dedicated resources

As mentioned in the previous section, the right utilization of consultants and the user representatives effectively lead to their satisfaction and continued presence. Any failure to do so by the top management and the project managers will result in high turnover of the project resources. The effect is depicted in [Figure 7].

The same happened in MCM as the consultants and user representatives left the project at different stages and at any point of time; no one could take ownership of the data and the scenarios involved in the design. The project team could not manage the expectations due to lack of dedicated resources.

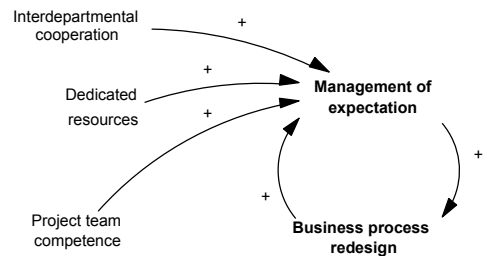


[Figure 7] Influential relationships around the dedicated resources

(8) Management of expectations

As shown in [Figure 8], project team competence, dedicated resources and interdepartmental cooperation were primarily responsible for the better management of expectations. But the factors like champion efficiency, user participation, use of consultants and management support also play their indirect role in meeting the project expectations. Perfect BPR is found to have a reinforcing effect because BPR will make the goals clear and lead to manage the expectations better.

In MCM case, due to a very bad management of expectations, the BPR was not carried out well and the blue print almost reflected the standard processes in SAP R/3. In PP modules interfacing the MM, the users expected lots of customization but that did not happen.



[Figure 8] Influential relationships around management of expectations and business process redesign

(9) Business Process Redesign

As depicted in [Figure 8], a very good management of all the project expectations starting from requirement gathering until integrated testing leads to a Business Process Redesign (BPR) meeting the exact user requirements. But the factors leading to the

better management of expectations as explained in previous section will have an indirect role to affect the accuracy of BPR. So in the nutshell for a company to successfully carry out the BPR implementation, the chain of events from beginning to end should be well managed.

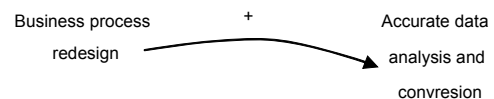
In MCM case, all the adverse effect from the project beginning had a cascade effect leading to the unsuccessful BPR. One of the users interviewed by the authors remarked: "The Material Requirement Planning implemented does not take care for the quality of leather in the warehouse. It simply suggests a material number for particular leather. Actually we use the 'First In First Out' principle to issue materials for our consumption. The batch management has not considered the expiry date into consideration. I better manually issue rather than relying on what the system suggests."

(10) Data Analysis and Conversion

The data conversion strategy is fully based on the reengineered design as in [Figure 9]. The list of materials, bill of materials, customer/vendor master data, pricing conditions, general ledger data, asset master data are all revised. New naming conventions and revised data are needed to design and test the revised business processes. Actually the effectiveness of requirement gathering is reflected in how accurately the data is converted from the existing legacy system suiting to the revised format of the new system requirement.

In MCM case, the failure of gathering the correct requirements led to wrong format and naming conventions of most of the master

data. The conversion of material master, which is the heart of the logistics operations, was an utter chaos. The vice president in charge of operation finally remarked: "Why should the system ask me to enter the standard price of a finished good. All the component materials needed to produce the finished good are already in the system with the corresponding price details. The operations carried out to produce the finished god are also already in the system. Then it should automatically calculate the price. I find the whole purpose of having this system defeated now." The above comments show that the system design did not cater for incorporation of functions to be carried out to serve the intended purpose.



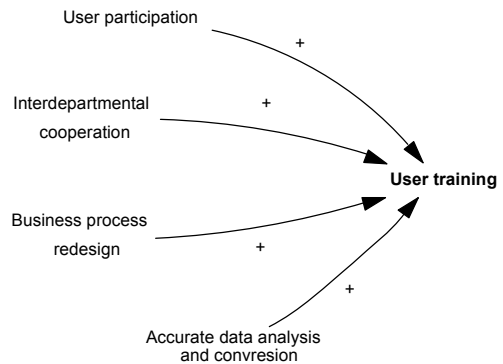
[Figure 9] Influential relationship around accurate data conversion

(11) User training

As shown in [Figure 10], the quality of user training primarily depends on how well the freshly designed system reflects their present as well as revised requirements, the willingness of competent users to participate in the training and co-operation between various departments to participate in the design and conduct of the training program. It is the responsibility of the project champion and the consultants in delivering required training to all the users of the system with the support of the top management. The document called the Concept of Operation has to be prepared in advance and the users informed accor-

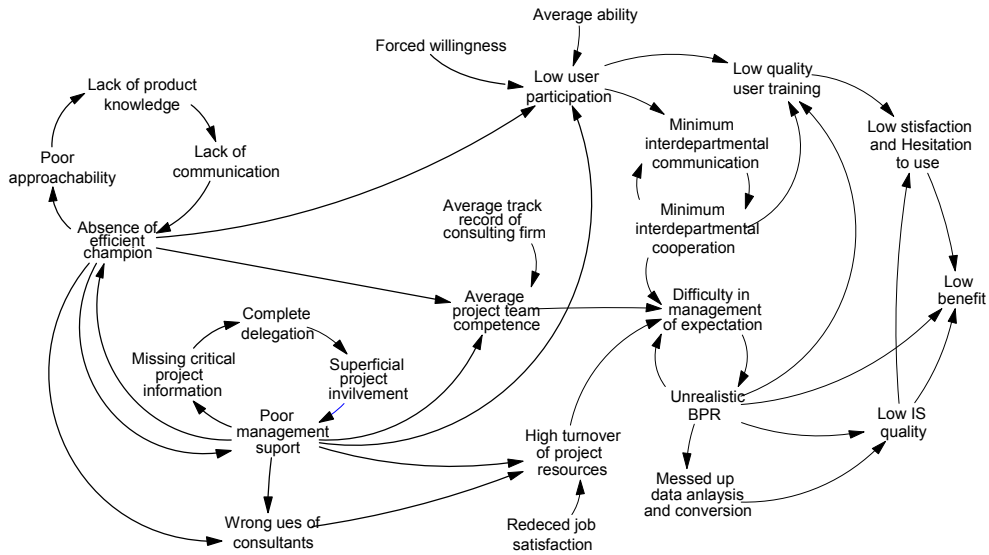
dingly. The important point to note at this stage is that some users, who were not actively involved earlier, may try to come out with the various shortcomings of the system. This is because they will be able to visualize the problems by carrying out their own transactions with their relevant data. At this point of time, if they notice considerable discrepancy between what they expect from the system and what the system actually provides, they may lose interest and confidence in further training and hesitate to use the system. Hence quality user training depends on how well it meets their business requirement.

In MCM case, the user never received quality training. The reason was, on one hand the users attended the training were not in a position to appreciate the system features and on the other hand the high profile users complained that the system was designed with simple and straightforward scenarios and did not consider all the possible combinations applicable to their business. One logistics user contacted by the authors remarked: “All the exercises in the training manual consider carrying out goods receipt first and then posting the invoice. This is not true. For some vendors, we receive the invoice first and the goods later. I tried to test that case on my own. But the system gives me error message saying that goods receipt not yet done for the purchase order. The consultant says he needs to reconfigure to remove the error message.” Hence we find that the users were not satisfied at all with the quality of training received and felt that the system was very much difficult to use.



[Figure 10] Influential relationships around user training

We realize that the system re-engineered and designed in MCM incorporated mostly the standard features and did not reflect the real needs of the users coupled with absence of a clear data conversion strategy for accurately converting the master data as needed for the system transactions, which resulted in a poor SAP R/3 system quality. The poor system quality combined with a low quality training received by the users amounted to users who were dissatisfied with the provided functionalities and exhibited much hesitation in using the system. The low system usage and the poor quality of design were factors leading to the company getting a low benefit of the system for achieving their business goals which finally resulted in scrapping of the system. Appendix 1 provides the complete process model of ES implementation by integrating the partial influential relationships among the identified factors. We can apply the developed process model to the failure case of MCM ([Figure 11]), which explains what factors and how the interactions among the factors lead to the failure.



[Figure 11] The process of ERP system implementation in MCM case

5. Discussion

After carrying out the analysis of the various factors that eventually led to the failure of the ES implementation, we identified influential relationships among the 11 implementation factors. Based on the factors and the relationship among them, we have come up with the process model for the ERP system implementation as in Appendix 1. The proposed model explains clearly the significant factors that are necessary for the successful implementation and how they interact with each other in order to lead to an outcome. We have made the following 10 propositions pertaining to the various implementation stages we have identified earlier in this paper.

Proposition 1: The choice of project champion has a critical bearing on the outcome of activities and events in the subsequent project phases leading to the success or failure of

the project.

An ideal project champion is one who has a good business knowledge across functions, possesses leadership qualities, can communicate at all levels, has a good understanding of the complexities involved in the different stages of the software development life cycle, can build a cohesive and competent project team and create a climate conducive for the involvement and cooperation among the team members and the different stakeholders, listens to their problems by taking a neutral role, offers the assistance for the timely resolution of problems identified, and finally ensures that the project becomes a success. Even though he need not possess the product knowledge, he can eventually acquire the same due to the qualities outlined above and become more and more effective.

Proposition 2: The track record or the suc-

cess record of the consulting company is a measure of the project team competency.

The consulting companies which are mainly in the business of offering management consultancy to their clients, continuously scout for business opportunities and will take every effort to capture the business once a client company reveals its intention to implement an ERP system. They may or may not have the quality consultants with them. It is for the client company to make the necessary preliminary investigation about the background of the consultants earmarked for the project and decide to accept or reject them. As for SAP R/3 system is concerned, a consultant who has gone through at least two full cycle implementations of similar nature, should be able to deliver as per the requirements. In many situations, the project champion in liaison with the Human Resource manager should be in a position to make the right choice. If due to some reason a consultant with little or no suitable background gains entry in the project, there must be a feedback mechanism in place to identify the underperformance/non-performance and the project champion should ask for the timely replacement for that consultant. Any failure to do so by the project champion will have adverse impact on the project delivery.

Proposition 3: Involvement of top management improves the overall competency of the project team leading to better user participation and more efficient use of consultants.

The top management normally tends to del-

egate the authority to supervise the project proceedings and take important decisions due to their limited time availability and rely only on periodic feedback from people who manage the project. On the other hand, they can show increased involvement to get up to date information about project progress, increased understanding of the system design and motivate the stakeholders for increased participation.

Proposition 4: Project awareness leads to greater participation and a clear project direction.

As only top management is involved during the initial proposal and contract award stage of the project, subsequent briefing by the management is necessary to clarify the objectives and goals of the project. This also helps to clarify the support of the top management, the significance of the project to the existing business, project schedules and deliverables, the expectation of each participant and the level of co-operation sought from each participant. Such a briefing from the top management leads to a climate for better user participation, communication, and co-operation among different departments.

Proposition 5: Estimation and tracking of the real project progress from early stages eliminates the risk of project failure.

ERP systems are usually implemented under a tight budget and time schedule. Hence there is a considerable schedule pressure to deliver on time. This may lead to a situation

where people managing the project overlook the minor setbacks/defects noticed and proceed to the next stage to report unrealistic progress. Such design deficiencies, if accumulated over stages, can become uncontrollable to manage. This is especially true if the people who were handling them before had to leave the project site. Hence free and fair assessment of the real progress made through accepting the mistakes at every stage and timely action for rectifying the known defects will reduce the probability of system failure.

Proposition 6: A good quality of deliverables at one stage leads to a better quality of deliverables at subsequent stages.

The flow of information between project members and from consultants to users and also from consultants to other stakeholders and vice versa is essential for making decisions affecting the system design and delivery. The implementation project is executed in stages and so the deliverables are also produced at the corresponding stages. Hence the accuracy and reliability of the information content of deliverables at any stage serve as useful guidance for carrying out the implementation at the next stage. For example, requirement gathered and accurately documented during the initial stages can help to prepare a blue print to design the system meeting its intended purpose.

Proposition 7: The continuity of competent section of the project team, which includes consultants and key users, is vital for the project success.

As the implementation progresses from one stage to another, the consultants and users carry the rich knowledge and experience along with them. They have to use them to make further decisions and make further progress in the project. If at any point of time, the project witnesses a turnover of key persons involved, it affects the progress as fresh entrants to the project may need time to understand the proceedings and start delivering. There is always a knowledge gap created due to handover. If the gap is wider and such handovers frequently occur at every stage, as it happened in MCM case, it may lead to the absence of dedicated resources. In addition, if people involved from beginning continue throughout the life cycle, due to their complete overview of the requirement, the project expectations can be managed better at every stage.

Proposition 8: Ensuring all round progress across modules leads to better data integrity and thereby better system quality.

As discussed earlier, the strength of ERP system lies in its data integration. It is also true that the successful operation of any module depends on the accuracy and effectiveness of data coming from and going to other modules. In view of this, uniform progress in all modules implemented is essential to test the data integration operation. But in many implementations, it may happen that the progress shown in one module is far beyond expectation and the implantation in other module lags far behind. Although the project team competency and user participation

are paramount reason for this phenomenon, the top management and the project champion can play a crucial role either to avoid such a situation or mitigate the adverse effects. They should identify this situation sufficiently early and offer the required assistance and support for allocation of additional resources, ensuring better user participation and putting in place the needed infrastructure. Any failure to ensure uniform progress will impact the schedules for system integration testing, user acceptance testing and also the user training. The neutral role played by project champion and the top management without any departmental bias is critical for ensuring uniform progress. In MCM case, we noted that the implementation of finance module was progressing much faster due to overwhelming support of the project champion and the implementation of logistics modules were considerably lagging behind. It finally led to poor data integrity.

Proposition 9: After identification of the higher level key users and the lower level end users, delivering the training to the key users first and asking the key users to train the end users lead to effective user training.

In implementation involving users of diverse background and abilities, it is essential that due consideration is given for such factors as social, educational and cultural background. The same is true for training. For example, not all the users will be comfortable to interact with all the consultants or project managers. So it is essential to identify first the key user who can understand the con-

sultant language and get familiar with the system jargons. Then he/she can train the lower profile end users. The hidden advantage here is that the higher end users can point out any missing gaps in the system during training, as the communication ability is higher in comparison to the lower end users. This gives way to further fine tune the system. The end users will not only be able to understand the system better from the key user but also will be able to quickly appreciate and test the system features. Ultimately the success of an ERP implementation depends on the ability of the end users to effectively use the system. They are the real users who are going to carry out the voluminous transactions under stress after the system goes online.

Proposition 10: Strategic management of post-live scenario has a bearing on the continuous availability of system benefit.

Once implemented, maintenance/support is another aspect to be taken care for harvesting the complete benefit of the implemented system. In a majority of SAP R/3 installations, the contractual obligation for the consulting company ends with the provision of a minimal post-live support for a period of 15 days to one month. Then it is for the client company to devise suitable strategies like extension of existing contract or entering into a fresh maintenance contract with external vendors or formation of a team of competent internal consultants or identification of competent key users, who have shown remarkable contribution during system development, to

take up the role of consultants. The management's strategic role in this regard will decide on the level of system support needed by the users for their day-to-day operations, accurate incorporation of changes in business requirements and upgraded functionalities in order to avail the continuous benefit of the system.

6. Conclusion and Implications

By adopting process theory, this study extracted critical factors and influential relationships among the factors associated with the outcome of ES implementation. The study then developed a process model of ES implementation (Appendix 1). The process model explains how and why a set of related factors influence each other and lead to certain outcomes in ES implementation. Closer examination of the proposed process model reveals a predictive capability for the ES implementation process. One change in any factor in the process model will ripple through all other related factors, thus affecting the outcomes of ES implementation. At any point in the course of an ES implementation project, alternative paths or corrective actions can be taken. This study facilitates an understanding of how to reverse repeating patterns of ES implementation failure. It also can be used as guidance for new ES implementation projects. Thus, the process model as a pattern in IS implementation can be translated into development strategies and tactics which organizations and developers can employ to improve the chances of suc-

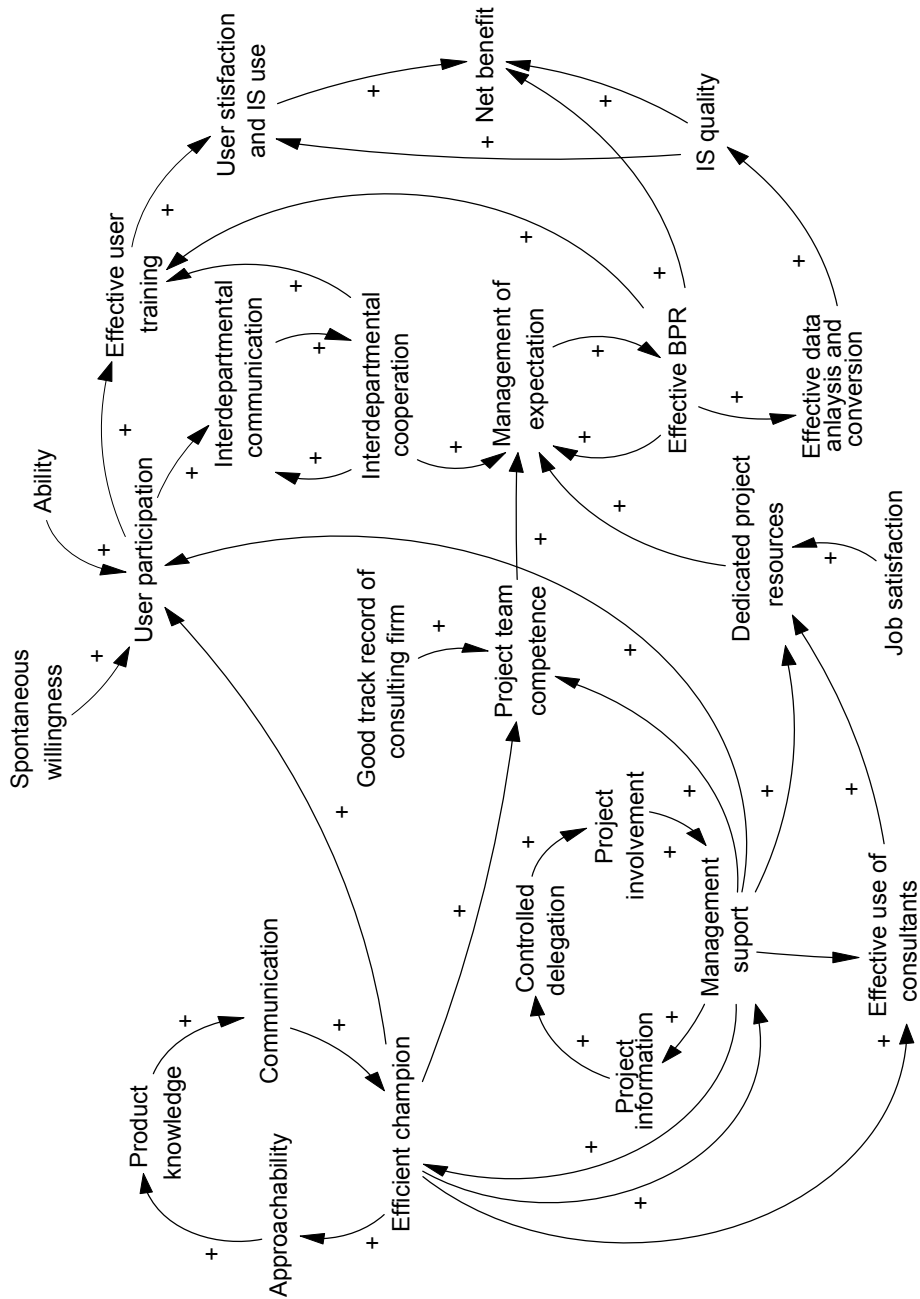
cess in their projects.

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〈Appendix 1〉 The Process Model of ES Implementation



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KAIST에서 경영정보공학으로 박사학위를 취득한 후, National University of Singapore의 정보시스템학과에서 조교수로 근무 중이다. Journal of Database Management와 Journal of Global Information Management의 편집위원이며, 국제저널에 20여 편의 논문을 발표하였다.



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서울대학교 경영학과를 졸업하고 KAIST 경영학과 및 테크노경영대학원에서 경영정보학 석사 및 박사학위를 취득하였다. 현재 국민대학교 경상대학 비즈니스IT학부에 재직 중이다. 주요 연구 관심분야는 Relationship between strategic agility and IT foundation, IT assimilation in organizations, IT-enabled organizational change, Knowledge management, and Consumer behaviour in electronic commerce 등이다. Behaviour and Information Technology, Communications of the Association for Information Systems, Decision Support Systems, Expert Systems with Applications, International Journal of Information Management, Journal of Database Management 등을 비롯한 국내외 학술지에 논문을 발표하였다.